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Bulletin of the University of New Hampshire

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UNH
Undergraduate
Catalog
1980–81

2 University Calendar 1980-81

Summer Session 1980

May 19 to August 15

Semester I 1980

August 31, Sunday
9 a.m. Residence halls open for freshmen

September 1, Monday
9 a.m. Residence halls open for upperclass students

September 1-2, Mon.-Tues.
Registration

September 3, Wednesday
8 a.m. Classes begin

September 8, Monday
Graduate student registration

September 12, Friday
Last day to drop courses without $10 late drop fee

September 19, Friday
Last day to add courses without dean's approval and $10 late add fee
Last day to choose pass/fail grading alternative

October 2, Thursday
Last day for partial tuition refund on withdrawal

October 24, Friday
Midsemester, last day to drop courses or withdraw without academic liability
Last day to carry more than 20 credits without surcharge

November 11, Tuesday
Veterans Day—no classes

November 26, Wednesday
Classes hold Tuesday schedule

November 27-28, Thurs.-Fri.
Thanksgiving—no classes

December 1, Monday
Classes resume

December 13-14, Sat.-Sun.
Reading Days

December 15, Monday
Semester I final exams begin

December 19, Friday
Final exams end; 7 p.m. Residence halls close

December 21, Sunday
Commencement

Semester II 1981

January 18, Sunday
9 a.m. Residence halls open

January 19-20, Mon.-Tues.
Registration

January 21, Wednesday
8 a.m. Classes begin

January 26, Monday
Graduate student registration

January 30, Friday
Last day to drop courses without $10 late drop fee

February 6, Friday
Last day to add courses without dean's approval and $10 late add fee
Last day to choose pass/fail grading alternative

February 19, Thursday
Last day for partial tuition refund on withdrawal

March 16-20, Mon.-Fri.
Semester break

March 22, Sunday
9 a.m. Residence halls open

March 23, Monday
8 a.m. Classes resume

March 27, Friday
Midsemester, last day to drop courses or withdraw without academic liability
Last day to carry more than 20 credits without surcharge

May 13-14, Wed.-Thurs.
Reading Days

May 15, Friday
Semester II final exams begin

May 22, Friday
Final exams end; 7 p.m. Residence halls close

May 24, Sunday
Commencement

Summer Session 1981

May 25 to August 21

The University reserves the right to modify the calendar subsequent to printing.

Contents

General Information
The University 5
Admissions 6
Division of Student Affairs 9
Financial Aid 11
Fees and Expenses 11
University Academic Requirements 13
Abbreviations 17
Degrees and Major Programs of Study 18
College of Liberal Arts 20
College of Life Sciences and Agriculture 35
College of Engineering and Physical Sciences 44
School of Health Studies 59
Whittemore School of Business and Economics 67
Special University Programs
Preprofessional, Interdisciplinary, Off-Campus, and Other 71
Associate in Arts in General Studies Degree 76
Thompson School of Applied Science 79
Division of Continuing Education 80
Summer School 81
Graduate School 82
Description of Courses 84
Trustees and Principal Officers 167
Faculty and Cooperative Extension Staff 168
Administrative Divisions 186
Enrollment Statistics 187
University Map 189
Index 191

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For information about undergraduate admission to the University, students should contact: **Eugene A. Savage, Dean of Admissions.**

For information about courses and academic records, students and former students should contact: **Stephanie M. Thomas, Registrar.**

General Information 5

The University

History

The University of New Hampshire, founded in 1866 as the New Hampshire College of Agriculture and the Mechanic Arts, was among the early state institutions of higher education whose formation was made possible by federal government land grants to establish colleges to serve the sons and daughters of farming and laboring families.

First situated in Hanover as part of Dartmouth College, New Hampshire College moved to its present campus in Durham in 1893 after Benjamin Thompson, a prosperous farmer, bequeathed land and money to further the development of the College.

The College thrived in Durham, and in 1923 the state legislature granted it a new charter as the University of New Hampshire, composed of the Colleges of Agriculture, Liberal Arts, and Technology. The Graduate School was formally added in 1928. The two-year program in agriculture, which had been offered since 1895, was formally recognized in 1939 and is now the Thompson School of Applied Science. The Whittemore School of Business and Economics was established in 1962.

In 1963, the University System of New Hampshire was created when the teachers' colleges at Plymouth and Keene were brought under the same Board of Trustees as the University. In 1969, the state legislature recognized the extended functions of the College of Agriculture, renaming it the College of Life Sciences and Agriculture, and the School of Health Studies was established as part of the University's programs. Beginning in 1971, the Division of Continuing Education was authorized to offer Associate in Arts degree programs as an additional approach to higher education for New Hampshire residents. In 1975 the College of Technology was renamed the College of Engineering and Physical Sciences.

Since 1967, the University has provided a widening range of undergraduate and graduate studies through its program at the Merrimack Valley Branch in Manchester. In 1977, the legislature recognized the branch as the Merrimack Valley College, the fourth campus in the University System. In 1972, the School of Continuing Studies was created to coordinate the off-campus educational programs of the University System institutions and to carry instructional services to communities throughout New Hampshire. In 1979, this school of the University System was renamed the School for Lifelong Learning.

In the 1979-80 academic year, the University had 10,714 degree candidates enrolled, including 453 in the Associate in Applied Science program of the Thompson School and 152 in the Associate in Arts program in the Division of Continuing Education. In the Division of Continuing Education, 1,473 special students also were enrolled.

Academic and cultural resources of each campus are amplified through System-shared programs and facilities. Cooperative ventures among the 12 member institutions of the New Hampshire College and University Council combine public and private higher education resources.

Campus

The home of the University is Durham, near the seacoast of New Hampshire—one of the oldest towns in northern New England. The town is semirural and still retains traces of its colonial past.

The campus, 188 acres in size, is surrounded by more than 3,000 acres of fields, farms, and woodlands owned by the University. A stream flowing through a large wooded area in the middle of the campus enhances the natural open space among the buildings—60 for teaching, research, and service, and 30 residence halls for men and women.

University Library houses 785,300 volumes, 6,359 periodicals, 6,923 tapes and records, and a substantial microfilm collection. Specialized subject collections in chemistry, engineering and mathematics, biological sciences, and physics are housed in four branches administered by a physical sciences librarian and a biological sciences librarian.

Athletics-Physical Education facilities, include indoor and outdoor swimming pools; tracks and courts; gymnasia; weight training, wrestling, and gymnastics rooms; a dance studio; a number of playing fields; and an indoor ice rink.

Memorial Union Building contains student activities offices, auditoria and meet-

6

Admissions

ing rooms, food services, games and craft areas, and lounges.

Paul Creative Arts Center, home of the departments of the arts, music, and theater and communication, contains two theaters and two art galleries.

Thompson Hall, the main administration building, is an official historic landmark.

College Woods includes 5 miles of well-kept paths through 260 acres of woods.

The New England Center, a cooperative effort by the six state universities of New England to offer outstanding continuing education programs, provides modern facilities for adult education conferences and seminars in its residence-dining-learning center.

John S. Elliott Alumni Center, completed in 1977, houses the alumni and development offices and serves as a focal point for alumni activities and campus meetings.

The University has one of the nation's largest DECsystem-10 computer installations, operating nearly continuously, with more than 200 terminals around the campus.

Teaching, Service, and Research

The University of New Hampshire is committed to offering excellent educational programs and opportunities for its students. The University's approximately 614 full-time teaching faculty provide a ratio of one full-time faculty member to about 17 full-time students. More than 80 percent of the full-time faculty hold doctoral or terminal degrees, and many have earned national and international reputations in their professional fields.

A faculty member's first responsibility is to teaching students. In the tradition of the nation's land-grant colleges, the University also encourages its faculty to contribute to the growth of human knowledge through scholarly research and service to the community beyond the campus.

Accreditation

The University of New Hampshire is a member in good standing of the New England Association of Schools and Colleges, the major accrediting body for the University. Specialized programs of study are also accredited by various professional organizations.

Interviews and Campus Visits

Candidates are encouraged to contact the Admissions Office to arrange an interview with a student admissions representative. These representatives are trained to give information about the academic organization of the University and the criteria used by the Admissions Committee in reviewing candidates, and they are best able to discuss student activities, living arrangements, and other aspects of UNH life. The University welcomes visitors to the campus and conducts scheduled tours for candidates. Also, frequent Saturday morning Group Information Sessions led by an Admissions Office staff member and student representatives are followed by guided tours of the campus. Please call the Admissions Office for information about dates and times.

Bachelor's Degree Candidacy

Admission to a bachelor's degree program is based upon successful completion of a four-year secondary school program of college preparatory coursework. Primary consideration is given to academic achievement and aptitude, as demonstrated by the quality of candidates' secondary school course selections, rank in class, recommendations, and the results of a College Entrance Examination Board Scholastic Aptitude Test. Consideration is also given to character, leadership, initiative, and special aptitudes and talents.

Secondary School Course Requirements

All candidates for bachelor's degree programs are expected to have completed certain secondary school courses. These minimum requirements are: at least sixteen secondary school course units, including four years of English, two years of college preparatory mathematics, two years of social science, and one year of laboratory science. Candidates for the College of Liberal Arts and the Whittemore School of Business and Economics must also present a minimum of two years of study in a single foreign language. Candidates for the College of Engineering and Physical Sciences must have completed at least three years of college preparatory mathematics, including a minimum of a half year in trigonometry, as well as two years of laboratory coursework including chemistry or physics.

The choice of secondary school program and courses may limit or enhance opportunities and achievements in college. Candidates are strongly encouraged to extend their knowledge and learning skills through work in the basic academic disciplines. Most successful candidates present at least four years of English, three years of college preparatory mathematics, three years of foreign language, two years of laboratory science, and two years of social science. Successful candidates have generally completed three years of study in a single foreign language or have completed more than one year of study in each of two different languages.

Candidates are expected to pursue in greater depth those fields in which they have special interests. For example, students who plan to specialize in engineering, science, mathematics, or forestry must present four years of mathematics including trigonometry, as well as laboratory coursework in chemistry and/or physics. For students planning to major in health-related disciplines, secondary school laboratory courses in biology and chemistry are strongly recommended.

The number of out-of-state students admitted to the University each year is limited. These candidates are asked to indicate their "prospective majors" on their application forms and will be considered for admission in competition with other out-of-state candidates applying for the same programs.

Approximately 60 percent of the University students request a change in major during their undergraduate years, and approximately 90 percent of such requests are approved each year. These changes are possible after a student has been at the University for a semester and has secured permission from the appropriate college dean and department chairperson. However, it is important to realize that the University cannot honor all requests for such changes; at present this is true for programs in nursing, medical technology, occupational therapy, computer science, and administration.

Admissions Tests Requirements

All candidates for admission to bachelor's degree programs are required to submit the results of a College Entrance Examination Board Scholastic Aptitude Test. While achievement tests are not required, successful scores on the Foreign Language Achievement Tests may enable an applicant to satisfy the foreign language requirement of the Bachelor of Arts degree programs. Other achievement tests are strongly recommended for candidates to the College of Engineering and Physical Sciences, the College of Life Sciences and Agriculture, and the School of Health Studies in the areas generally related to the student's prospective major.

Art and Music Candidates

Candidates applying for the arts major, studio option, or the Bachelor of Fine Arts program are required to submit a portfolio. There is no portfolio requirement for those entering the art history option of the arts major. Candidates applying for programs in the Department of Music must make arrangements with the department chairperson for an audition. Chairpersons of both the arts and music departments may be reached at the Paul Creative Arts Center.

Freshman Admission Application Deadlines

Except for Early Decision candidates, applications should be submitted only after the first marking period grades are available and, for nonresident applicants, before February 1. New Hampshire applicants must submit their applications by February 1. Applications received from New Hampshire residents after that date may be considered only as vacancies occur. A nonrefundable application fee, $10 for New Hampshire residents and $20 for nonresidents, must accompany the application.

Early Decision

The University encourages freshman applicants who desire fall enrollment to apply for admission under an Early Decision program designed for well-qualified students who have made UNH their first-choice school. Applicants must submit a regular application, high school record, junior-year Scholastic Aptitude Test score, and a statement countersigned by the secondary school counselor which indicates that the University of New Hampshire is the first-choice college and that other applications will be withdrawn if the candidate is admitted under Early Decision. Candidates for admission under the Early Decision program must file their applications and all supporting credentials between September 15 and December 15 and will be notified of the decision within three weeks of the receipt of application materials.

Deferred Admission

The University considers applicants for deferred admission, which enables students to reserve a space in college while taking time off from school for work or travel. The University may not be able to offer deferred admission in certain program areas, however.

Advanced Standing

The University will recognize unusual secondary school work by means of advanced placement and credit for those who have taken enriched or accelerated courses before entering college. Applicants qualify for such credit by satisfactory achievement on University-approved placement examinations, including the College Board Advanced Placement Tests, or through College Level Examination Program (CLEP). Further information may be obtained from the Admissions Office.

Associate Degree Candidacy

The University accepts candidates for Associate in Applied Science and Associate in Arts degree programs who have demonstrated ability and motivation for learning through secondary school achievement, work experience, and/or military service.

Both New Hampshire residents and out-of-state students may be considered for admission to Associate in Applied Science degree programs offered by the University's Thompson School of Applied Science. Students admitted to the Thompson School will be eligible for University residence hall accommodations. Two of the programs offered by the Thompson School, forest technology and civil technology, require that candidates present a minimum of two years of college preparatory mathematics (see also Thompson School chapter).

The University offers an Associate in Arts degree program through the Division of Continuing Education. This program is available only to commuting New Hampshire residents, although this rule may be waived if the applicant is a full-time employee of a New Hampshire business. Out-of-state candidates for whom this rule is waived are liable for out-of-state tuition and fees, however (see also Associate in Arts chapter).

Eligibility for Degree Candidacy

Applicants who meet the appropriate requirements for admission may become candidates for any undergraduate degree offered by the University. However, applicants having a degree will not be admitted into a program of study that awards the same degree (e.g., B.A., history, and B.A., zoology). Applicants may, however, be admitted into a program awarding a different degree (e.g., B.A., history, and B.S., biology; or B.A., history, and A.A.S., business management).

Readmission

An undergraduate who withdraws or is suspended or dismissed from the University thereby terminates degree candidacy and must apply for readmission before the deadlines established by the Admissions Office. Before seeking readmission, suspended students must remain away from school for at least one semester. Applications submitted by suspended students are referred to the dean of the college or school to which they are applying, and evidence must be presented that they can successfully resume University work. Only under extraordinary circumstances will students be readmitted after having been dismissed for academic reasons. Applications submitted by dismissed students must be reviewed by the University's Academic Standards and Advising Committee. Students applying for readmission should realize that it may not be possible to enroll in certain programs that have established enrollment limitations, and no

8

assurance can be offered that University housing will be available.

Transfer Students

The University will consider qualified candidates desiring to transfer from approved institutions. Transfer credit is awarded for courses that have been completed with a grade above the lowest passing grade, provided those courses are comparable to courses offered at the University of New Hampshire. The University encourages competent applicants who have valid and legitimate reasons for desiring a transfer to UNH; however, it cannot encourage applicants with a history of academic or personal difficulty. Students who have encountered such difficulty are usually better advised to return after an appropriate period to their former college and improve their record before attempting to transfer.

Students enrolled in one of the University's associate degree programs who desire admission to a baccalaureate degree program at UNH must apply as transfer students through the Admissions Office. A recommendation from the associate degree adviser is also required.

Transfer applicants should realize that it may not be possible to enroll in certain programs that have established enrollment limitations, and no assurance can be offered that University housing will be available.

Students desiring to transfer for the fall semester must complete application procedures before March 1; for spring semester, by November 15.

No portion of students' grade-point averages may be transferred; that is, previous grand-point averages will not be calculated in the ones earned by students at UNH.

New England Regional Student Program

The University participates in the New England Regional Student Program of the New England Board of Higher Education, in which each state university in New England offers a number of regional curricula at the undergraduate level to students from other New England states. Under this program, students receive preferential admission consideration and, if admitted, pay the UNH in-state tuition plus 25 percent. Students must indicate on the application their intention to apply for this reduced tuition. Information about the curricula may be obtained from the New England Board of Higher Education, 68 Walnut Road, Wenham, Mass. 01984.

Special Student Status

UNH offers the special student classification for persons who wish to participate in University coursework without entering degree programs. Special (nonmatriculated) students register for coursework through the University's Division of Continuing Education and are usually restricted to part-time study (maximum of 11 semester hours) unless permission is granted by the Admissions Office. Special students have full access to the academic counseling services of the division and should realize that their continuing participation in University coursework is predicated upon satisfactory achievement.

Rules Governing Tuition Rates

All students attending any division of the University of New Hampshire in any capacity shall be charged tuition at a rate to be determined by their domicile. Those domiciled within the state of New Hampshire shall pay the in-state rate. Those domiciled elsewhere shall pay the out-of-state rate.

Students are classified as residents or nonresidents for tuition purposes at the time of admission to the University. The decisions, made by the dean of admissions, are based upon information furnished in students' applications and any other relevant information.

All applicants living in New Hampshire are required to submit a notarized statement to the effect that their parents have been legally domiciled in New Hampshire continuously for a period of at least twelve months immediately prior to registering for the term for which the students are claiming in-state status. Sudents admitted from states other than New Hampshire or from foreign countries are considered nonresident throughout their entire attendance at the University unless they have acquired bona fide domicile in New Hampshire.

If students maintain residency apart from that of their parents, they must clearly establish that their residence in New Hampshire is for some purpose other than the temporary one of obtaining an education at the University. To qualify for in-state status, students must have been legally domiciled in New Hampshire continuously for a period of at least twelve months prior to registering for the term for which in-state status is claimed.

The burden of proof in all cases is upon the applicants. In all cases, the University reserves the right to make the final decision concerning resident status for tuition purposes.

For a copy of the University's rules governing tuition rates, simply write to the Admissions Office.

Student Affairs

The Division of Student Affairs provides a broad range of student services and programs to supplement the academic programs of the University.

The Division includes the Dean of Students Office; Residential Life (residence halls, married student housing, and dining services); Student Activities/Memorial Union; Health Services; Counseling and Testing Center; Career Planning and Placement Service; Handicapped Student Services; Financial Aid; and the Office of the Vice President for Student Affairs.

The Division annually publishes a student guide, which includes statements of privacy rights as required by the Family Educational Rights and Privacy Act of 1974.

Dean of Students Office

The Dean of Students Office has major responsibility for the quality of student life on campus. The staff has a working knowledge of the entire University (policies, procedures, and people) and interacts regularly with students, staff, faculty, trustees, and other persons who are interested in or involved with what is happening at UNH.

Within the Dean of Students Office, there are eight specific areas of responsibility: judicial affairs, Freshman Orientation (Summer), freshman continuing orientation (Learning Center, Freshman Council, etc.), California Exchange Program, women's issues, international students, nonacademic policies and procedures, and Commuter/Transfer Center. Students and others are encouraged to contact the Dean of Students Office whenever they have a question, concern, or problem involving University life.

Residential Life

The Department of Residential Life is committed to providing a living environment that maintains high standards of health and safety and a learning environment that supports the total educational experience.

Residence Halls Undergraduate University housing is limited to full-time degree candidates; Associate in Arts degree and Division of Continuing Education students are not eligible for on-campus housing. Students are not required to live on campus. University housing is not guaranteed for the full four-year undergraduate period.

Applications for housing are sent to entering freshmen soon after payment of the advance tuition deposit and must be accompanied by a $50 housing application fee. Freshmen are guaranteed housing as long as the specified housing application deadline is met. Housing for transfer and readmitted students is not available Semester I. However, residence hall space is generally available Semester II.

The University reserves the right to adjust room and board charges and policies when necessary; however, such adjustments will be announced as far in advance as possible. Additional information about residence halls and dining services is available through the Office of Residential Life.

Dining University policy requires that undergraduate students living in residence halls board in UNH dining halls.

Nonresident full-time students may purchase a board plan or a thirty-five meal commuter plan. Single meals may be purchased in the dining halls or at the Memorial Union cafeteria.

The dining halls offer a broad range of menu selections, enabling the diet requirements of most students to be met. However, a student with unusually restricted menu requirements because of medical prescription or religion should inquire with Dining Services as to whether these special needs can be met by dining hall menus.

Residence halls are not equipped for meal preparation. Students who prefer to prepare their own meals should seek off-campus accommodations with good kitchen facilities.

Student Activities/Memorial Union

The Office of Student Activities in the Memorial Union serves as the center for cultural events, student organizations, and related activities. It provides a wide variety of services and programs for the entire University community.

Student Activities Serving as a programming resource for students and other members of the community, the office provides administrative coordination for campus-wide events and operates the Memorial Union as an integral part of the University.

Students participate in approximately eighty recognized organizations, each with special interests, which include academics, politics, religions, careers, service, and social fraternities and sororities. A Student Activities Fee, determined by the Student Senate, provides funds for: *The New Hampshire*, the student newspaper; WUNH-FM, the student radio station; *The Granite*, the UNH yearbook; the Student Television Network; Student Senate; Student Press; the Women's Center; Cool-Aid, the campus crisis referral service; and two programming organizations, the Memorial Union Student Organization (MUSO) and the Student Committee on Popular Entertainment (SCOPE). Additional funds are available on request to other organizations for special programs.

Programs range from lectures, concerts, films, and educational seminars to special events like Parents' Weekends, Homecoming, the Christmas Crafts Fair, Winter Carnival, and spring dances. Teaching programs emphasize skills in creative expression, leadership, and basic organization.

Memorial Union As the University's community center, the Memorial Union serves as the focus for student programs and provides services for the entire University community. Students, faculty, and staff on the Memorial Union governing board work with the director to set policies for the operation of the building and those student activities related to the building. Building services include the University Information Center and Ticket Office, the Cat's Closet Store, a crafts center, a scheduling office for room and facility reservations, and a food service operation consisting of a cafeteria, Pistachio's sweet shoppe, pub, and catering service. The games area on the lower level of the building has candlepin bowling lanes, pool and billard tables, pinball machines, and table tennis tables. The Commuter/Transfer Center and lounge provides a focal point for commuter students.

10

Health Services

The University Health Services located in Hood House provide comprehensive primary health care, including: laboratory examinations, X rays, physical therapy, pharmacy services, and limited mental health care. Both inpatient and outpatient care is available. The Health Service staff maintains close personal and professional relationships with other medical and surgical specialists in the local area to whom they may refer patients when medically indicated. Three well-staffed and equipped acute care community hospitals are located nearby, and an emergency ambulance service is available in Durham at all times.

During the regular academic year, Hood House is staffed by full-time physicians, adult registered nurse practitioners, nurses, and part-time consultants. Appointments with physicians may be made upon request. An appointment is not necessary for medical problems requiring immediate attention, and such cases will be treated through the outpatient clinic on a walk-in basis.

A mandatory health fee is assessed all undergraduate and graduate degree candidates and all full-time non-degree candidates. The academic year 1980-1981 health fee is expected to be $40. Payment of the fee entitles the student to unlimited visits to Health Services physician, nurse practitioners, and clinic nurses; unlimited routine X rays and laboratory procedures performed in Hood House; Health Educator visits; cold clinic self-care medicines; the first $50 of off-campus laboratory work when it is ordered by a Health Services staff member and the specimen is collected in the Hood House laboratory for transmittal to the Health Services laboratory contractor; medicines for treatment of acute illnesses and injuries as long as the medicine is stocked in the Hood House pharmacy; family planning services; physical therapy; one visit to the Health Services orthopedic consultant each semester, one physical examination except for routine exams without specific purposes and those in lieu of the Data Acquisition for Student Health (DASH) form; and one day inpatient care in the Hood House infirmary each semester. Services not included under the health fee are: medicines for treatment of chronic illness; X rays performed outside of Hood House; off-campus laboratory tests performed by the Health Service laboratory contractor in excess of the first $50 and laboratory tests performed in any other laboratory (e.g., Wentworth Douglass Hospital, Leary Lab, etc.); contraceptive devices or medicines; emergency room visits or visits to any other health care activity or person, including physician office visits and emergency room visits ordered by the Health Services staff. An optional student accident and sickness insurance policy is available through Hood House. Its cost is moderate ($72 for a full year in 1979-80) and it covers most health care needs not covered by the health fee, including major medical payments. It is specifically designed to work in conjunction with the student health fee and may supplement or replace other insurance.

Health Record Requirement In order to provide effective health service, the University requires that students who have been formally accepted for bachelor's or associate degree candidacy and who register for nine or more semester credit hours must have complete medical records on file with the University Health Service. These records consist of a special health form furnished before registration. Students wishing exemption from this requirement on religious grounds must make a written request to the medical director of the University Health Service. It is the responsibility of students to complete the form before the beginning of classes. Any students failing to submit the completed form will not be allowed to register for classes in the subsequent semester.

Counseling and Testing Center

The Counseling and Testing Center offers students, without charge, professional counseling assistance in meeting a variety of personal, educational, and vocational problems. Services include individual and group counseling, vocational testing, and information on national testing programs such as the Graduate Record Examination. Counseling is available for special need or minority students, reentering women, and handicapped students. Individual clinical testing is available when indicated.

The staff is committed to the welfare and development of UNH students. The center sponsors a variety of student-oriented activities; e.g., personal skills groups on such topics as communication, values clarification, and life planning. The staff is available for consultation with faculty, administrative staff, and parents on matters relating to the welfare of students.

All information about a student's visits to the Counseling and Testing Center is confidential and cannot be released to anyone without the permission of the student.

Career Planning and Placement Service

The Career Planning and Placement Service assists students in planning for careers. The assistance available to students includes an on-campus interview program, which brings recruiting personnel to the campus between November and April; a library of information on employers and career opportunities; career/life counseling; and aid in finding summer employment. The service is available to all undergraduates; early use is encouraged.

College Council Placement Office The College Council Placement Office (CCPO) is a student service program funded by the New Hampshire College and University Council, of which UNH is a member. Students are encouraged to take advantage of this supplementary resource. The CCPO may be contacted directly at its Manchester, New Hampshire, office or through the University's Career Planning and Placement Service.

Handicapped Student Services

Students with a physical or mental disability that limits one or more major life activities such as walking, seeing, hearing, speaking, working, or learning, are encouraged to inform the Office for Handicapped Student Services, Room 105, Hewitt Hall, of the enabling accommodations they require.

The University encourages handicapped members of its community to use existing services and to become involved in the mainstream of campus life. Inquire through the Office for Handicapped Student Services for information about priority scheduling, accessible classrooms, special parking arrangements, assistance in securing auxiliary aids, and the advisory board for handicapped students.

Financial Aid

The University Financial Aid Office assists promising students who are unable to meet educational expenses entirely from their own family resources. Aid is available in the form of grants and scholarships, loans, and part-time employment. The financial aid issue of the *Bulletin of the University of New Hampshire* contains specific program information, and a financial aid brochure gives application procedures and deadlines.

In many communities, scholarships and loans are available locally. School principals and guidance counselors have information about these sources of assistance, which are available both to high school seniors and adult students.

Before applicants may be considered for assistance by the University, two forms must be submitted: the UNH Application for Financial Aid and the Financial Aid Form. New Hampshire applicants may obtain these forms from their high schools or from the UNH Financial Aid Office. Nonresidents and transfer students may obtain the UNH application form from the Financial Aid Office and the Financial Aid Form from that office or from their local high schools. Upperclass applicants may obtain both forms from the Financial Aid Office.

Students should meet the following priority deadlines and should not wait until being admitted to the University before applying for financial aid:

Undergraduate Students: February 15

Graduate Students: May 1 (for NDSL, UNH loans, and College Work-Study; for information about other aid for graduate students, refer to the Graduate Bulletin)

Grants and Scholarships

Admitted undergraduate degree candidates who will attend UNH on a full- or part-time basis may be considered for in-state tuition grants and University scholarships. Nonresidents are eligible for similar assistance. The basic consideration is financial need, although some scholarships are awarded on the basis of scholastic attainment, participation in extracurricular activities, or meeting specific requirements of a donor.

The University participates in the federally sponsored Supplemental Educational Opportunity Grant Program, which is designed to assist students of exceptional need who are admitted degree candidates attending on at least a half-time basis.

Basic Educational Opportunity Grant Program Students may apply directly to the federal government for a Basic Educational Opportunity Grant by utilizing the appropriate Basic Grant section of the Financial Aid Form or by completing a separate application available in the Financial Aid Office or from high school guidance counselors. Basic grant recipients must reapply each year for a grant.

Loan Programs

Three loan funds are administered by the University: UNH Loan Fund, National Direct, and Nursing Student Loans. Admitted undergraduate and graduate degree candidates who will attend the University on a full- or part-time basis may be considered for these loans. According to federal law, nursing loans are available only to full-time students. Financial need must be clearly demonstrated, and loans may be used only for educational expenses.

Many states now have higher education loan plans established by the Higher Education Act of 1965. Contact your local bank or other lender for information about these loans.

Part-Time Employment

The College Work-Study Program, both academic year and summer, assists students who, as determined by the Financial Aid Office, need financial assistance for their educational expenses. Admitted undergraduate and graduate degree candidates attending on at least a half-time basis are eligible for consideration.

Students who do not qualify for the College Work-Study Program may find part-time employment on or near campus.

Fees and Expenses

The cost for the freshman year at the University averages about $3,700 for residents of New Hampshire and about $6,300 for nonresidents.

Tuition

Tuition is $1,150 ($3,700 for nonresidents) per academic year. Undergraduates registering for 12 credits or more per semester pay the full tuition.

Students are permitted to enroll for more than 20 credits only with the approval of their college or school dean. After midsemester, persons carrying more than 20 credits will be billed a per-credit fee of $35 for each credit above 20 for resident students and $115 for nonresident students. (No refund will be made if a student subsequently drops a course, bringing the credits to 20 or fewer.) Resident undergraduates registering for fewer than 12 credits pay $35 per credit hour, plus a registration fee of $5 per semester. Nonresident undergraduates registering for fewer than 12 credits pay $115 per credit hour, plus a registration fee of $10 per semester. The minimum charge for any recorded course is $35 for residents and $115 for nonresidents.

All students who are admitted to the University must pay an advance deposit—$50 for residents and $100 for nonresidents—plus a nonrefundable fee (freshmen—orientation; transfers—administrative). Only the deposit will be credited on the tuition bill. If students decide not to attend the University, these payments will automatically be forfeited.

Three-fourths of tuition charges will be refunded to students withdrawing or dropping courses within one week of registration; one-half after one week and within 30 days; and none thereafter. (See University Calendar, page 2.) A degree candidate who withdraws from UNH and subsequently enrolls as a special student within the following year will be billed for tuition and fees on the same basis as degree candidates. Students with outstanding financial obligations to the University must clear their accounts before their registration will be confirmed.

A $10 fee must be paid by all students dropping courses after the second Friday of classes. The $10 fee will not be charged to persons changing to a reduced load or withdrawing; in both of these cases, the

12

regular tuition rebate policy will apply. If a student has received permission to add a course after the third Friday of classes, a $10 fee will be assessed for each course added. A change of section within the same course is accomplished by a "drop" of one section and an "add" of another; however only one $10 fee is assessed under these circumstances.

Fees

Fees (1979/80) are: Memorial Union fee, $42.50; recreation/physical education fee, $30; student services fee, $17.50; and a student activity fee, $25, which includes a subscription to the student newspaper and yearbook and membership in Student Union, Student Government, and class activities. These fees cover the academic year. Degree candidates registered for less than 12 credits are charged the preceding mandatory fees on a prorated basis.

An optional student season-athletic ticket may be purchased for $20. Optional student accident and sickness insurance is available for all degree candidates and full-time non–degree candidates. Participants in intercollegiate athletics are required to purchase the student accident and sickness insurance or demonstrate proof of comparable insurance to the respective athletic department. The 1979-80 cost for student accident and sickness insurance was $72 for a full calendar year. There is a mandatory $20 per semester health fee assessed to all degree candidates and full-time non–degree candidates.

There are no refunds of these fees. Any amount owing to the University will be deducted from any rebate due to a student.

Room and Board

Housing charges average $825 per academic year. In 1979-80, an energy surcharge of $72 was assessed all students living in residence halls.

Students applying for a room on campus must include a $50 prepayment fee with the housing application. Written notification of cancellation of the room application or assignment received before August 15 will result in forfeiture of the fee. Written notification of cancellation after August 15 and before closing Registration Day will result in a charge of one-fourth of the full semester's room rent. If students fail to occupy assigned rooms by one day after Registration Day, their Room Contracts will be canceled and the students charged for one-half of the full semester's rent. Written notification of cancellation of room received by the Office of Residential Life after Registration Day and within 30 days from Registration will result in the students' being charged for one-half of the full semester's rent. For cancellation of room 30 days or more after Registration, students will be charged for the full semester's rent.

Refunds on meal tickets will be granted only on approved waivers or withdrawal from the University. Cancellation of a meal plan before Registration Day will result in a 100 percent refund; after Registration Day but before the end of the first week of the semester, 75 percent refund; and after the end of the first week but before the end of the fourth week, 50 percent refund. Refunds after the fourth week through the end of the twelfth week will be based on the remaining food cost portion of the meal plan. No refunds will be made after the end of the twelfth week. Generally, rebates will not be allowed for missed meals except in the case of illness.

Deposits

Refundable deposits may be required to cover locker keys or loss or breakage in certain departments. A charge will be made for individual lessons in music, as noted in the description of applied music courses. A charge will be made for riding lessons and SCUBA, as noted in the sections on animal sciences and physical education, and for field trips of the Thompson School, the Institute of Natural and Environmental Resources, and home economics. For certain courses, there are also lab fees.

Other Expenses

Books and classroom supplies cost approximately $200. These may be purchased at the University Bookstore.

Personal expenses average $500. These will vary with the needs of individual students, and include clothing, laundry, recreation, incidentals, and travel.

Payment

All bills, including those for room and board in University buildings, are due and payable in full on or before Registration Day for each semester.

Parents and students who wish to make periodic payments should consult their local banks or other financial institutions that provide programs for budgeting educational expenses.

Fees and Expenses (1979-80)	N.H. Residents	Non-Residents
Tuition	$1,150.00	$3,700.00
Room (average)	825.00	825.00
Board (19 meals/wk.)	800.00	800.00
Activity fee	25.00	25.00
Recreational/physical education fee	30.00	30.00
Memorial Union fee	42.50	42.50
Student services fee	17.50	17.50
Health fee	40.00	40.00
Books, class supplies	200.00	200.00
Total	**$3,130.00**	**$5,680.00**
Individual expenses	500.00	500.00
Athletic admissions ticket (optional)	20.00	20.00
Health insurance (optional)	72.00	72.00
Energy surcharge (students living in residence halls only)	72.00	72.00

University Academic Requirements

13

General Education Requirements

To be graduated from the University of New Hampshire, students must fulfill three types of requirements: University (General Education), degree, and major requirements.

In addition to the particular requirements for specific degrees, all candidates for a bachelor's degree must successfully obtain a passing grade in a minimum of 128 credits in courses numbered 400-799, must maintain a cumulative grade-point average of at least 2.00 for all courses taken at the University in which a grade is given, and must successfully meet, as soon as possible in their University careers, the following General Education Requirements:

Group I

Four courses, each of which must carry at least three credits, from the biological sciences area and from the physical sciences and mathematics area. Students must select at least one course from each of these areas. Pass/fail may not be used for courses taken to meet this requirement.

Biological Sciences
Animal Science 400, 401
Biochemistry 402, 501
Biology 401, 402, 403, 420
Botany and Plant Pathology 411 or 412, 503, 525, 566
Entomology 400 or 402
Forest Resources 634
Hydrology 504
Microbiology 501, 503
Plant Science 421, 522, 535
Soil Science 501 or 502
Zoology 412, 507-508, 542

Physical Sciences and Mathematics
Chemical Engineering 501, 502
Chemistry 401-402, 403-404, 405, 406
Computer Science 410
Earth Sciences 401, 402, 409, 501
Electrical and Computer Engineering 431, 432
Inter-College 650
Mathematics 419, 420, 425-426, 636
Mechanical Engineering 561
Physics 401-402, 403-404, 405, 406, 407-408, 411
Technology 405

Group II

Six courses, each of which must carry at least three credits, from the arts and humanities area and the social sciences area. Students must select at least two courses from each of these areas. Pass/fail may not be used for courses used to meet this requirement.

Arts and Humanities
The Arts 431, 432, 480, 481, 482, 483, 484, 485, 486, 501, 513, 519, 525, 532, 542, 551, 567, 575, 577, 578, 580, 582, 583, 585, 586, 588, 589, 593, 594, 597
Classics 501, 506, 512, 521, 522
English 501, 505, 512, 513, 514, 515, 516, 518, 519, 520, 521, 522, 523, 525, 530, 531, 532, 533, 585, 586, 595, 657, 685, 690
French 503-504, 605-606, 620, 621, 622
German 503-504, 525, 526, 693, 694
Greek 503-504
Humanities 401, 501, 502, 503
Italian 503-504, 605, 606
Latin 503-504
Linguistics 505 (same as English 505), 506 (same as Classics 506)
Music 401, 402, 511, 513
Philosophy 401, 412, 416, 417, 421, 424, 430, 435, 475, 496, 520, 530, 550, 570, 571, 575, 577, 600, 630, 635
Russian 503, 504, 521
Spanish 503-504, 507-508, 525, 526, 621, 622, 651, 652, 653, 654
Theater and Communication 402, 404, 435, 436, 438, 457, 461, 462, 463, 503, 555, 572, 638, 656
Women's Studies 401 (may also be taken as a social science course)

Social Sciences
Anthropology 411, 412, 512, 614, 616, 618
Economics 400, 401, 402 (or REco 411 but not both), 515, 518, 615, 630
Geograpy 401, 402, 512, 513, 531, 540, 581, 582, 583, 610, 683
History 401, 501, 503, 504, 505, 506, 510, 521, 522, 531, 532, 535, 559, 560, 575, 576, 579, 580, 585, 586, 587, 588, 595, 596
Home Economics 525
INER 635
Political Science 400, 401, 402, 403, 500, 506, 520, 521, 522, 523, 553
Psychology 401, 471, 511, 521, 531, 561, 581, 621, 651, 671, either Soc 500 or Psyc 652

14

Recreation and Parks 400
Resource Economics 411 (or Econ 402 but not both), 506, 507, 508, 606
Social Service 522
Sociology 400, 530, 540, 560, 600, 611, 612, 615, 629, either Soc 500 or Psyc 652
Women's Studies 401 (may also be taken as an arts and humanities course)

Group III

Six courses, one of which may be Engl 401 (required for graduation), and each of which must carry at least three credits, from all courses offered by the University, including those in Groups I and II.

Courses that may be used to meet Group I and Group II requirements are approved by the Calendar and Curriculum Committee of the University Academic Senate.

The University, college, or department may prescribe up to eight of the sixteen courses used to satisfy the General Education Requirements. At least eight courses are to be freely elected by the student. Courses taken to satisfy General Education Requirements may not be in the student's declared major. Thompson School courses taken by a regularly matriculated student will not satisfy General Education Requirements except in specified cases in certain approved programs.

Engl 401 (freshman reading and composition) is required of all undergraduates. It may not be used to satisfy the arts and humanities area General Education Requirement, nor may it be taken pass/fail.

Grades

Instructors assign grades as listed below; grade points per semester hour are indicated in parentheses. For all undergraduate courses, grading standards established by the Academic Senate are that a C indicates competent, acceptable performance and learning; B indicates superior performance and learning; and A indicates excellent performance and learning. These standards apply to all undergraduate courses, instructors, departments, subjects, and colleges. The University reserves the right to modify grading and honors practices.

A (4.00)	excellent
A− (3.67)	intermediate grade
B+ (3.33)	intermediate grade
B (3.00)	superior
B− (2.67)	intermediate grade
C+ (2.33)	intermediate grade
C (2.00)	satisfactory, competent
C− (1.67)	marginal grade
D+ (1.33)	marginal grade
D (1.00)	marginal grade
D− (0.67)	marginal grade
F (0.00)	failure: academic performance so deficient in quality as to be unacceptable for credit
WF (0.00)	withdrawal while failing; the 0 credit is computed in student's grade point average
AF (0.00)	administrative F (usually indicates student stopped attending without dropping the course); is included in grade-point average
Cr	credit: given in specific courses having no letter grades, designated CR/F
P	passing grade in a course taken under the pass/fail grading alternative
W, W—	withdrawal grade—assigned if withdrawal is later than midsemester; is not included in grade-point average
AU	audit—no credit earned
IC	grade report notation for incomplete course
IA	indicates "incomplete" in a continuing course or thesis; where appropriate, the grade earned will replace "IA" assigned in previous semesters
IX	grade not reported

Students earning a semester or cumulative grade-point average less than 2.00 are placed on "academic warning."

Pass/Fail While earning a bachelor's degree, students may choose the pass/fail grading alternative: a) for a maximum of 16 credits during their matriculation; b) for a maximum of 4 credits per semester; c) in courses *other than* major requirements, optional minor requirements, Engl 401, and Group I and II requirements.

For B.A., B.F.A., and B.M. candidates, the pass/fail alternative is not permitted in courses that are used to meet the foreign language requirement. No Whittemore School course may be taken on a pass/fail basis by a student majoring in administration, economics, or hotel administration.

The minimum passing grade for credit is a D− (0.67); any grade below this minimum is a fail. All grades will be recorded on the grade roster as A, B, C, D, F, or intermediate grades. The pass/fail marks will be placed on students' transcripts and grade reports by the Registrar's Office. The course will not be included in the grade-point calculation, but the pass or fail will be recorded, and in the case of a pass, the course credits will be counted toward degree requirements.

Students may not use the pass/fail alternative to repeat a course. Associate in Arts students, see page 78.

Honors Students completing a semester with at least 12 graded semester hours whose grade-point averages are 3.20 or higher for the semester are designated as honor students for the following semester. These categories will be used: 3.20 to 3.49 honors, 3.50 to 3.69 high honors, and 3.70 to 4.00 highest honors.

Seniors who have earned honors for their entire college work will be graduated with the honors earned, and their names will be printed in the commencement program. The honors will also be shown on the student's diploma, provided that a minimum of 64 graded semester hours have been completed at the University. Latin equivalents of the honors classification will be used on the program and on the diploma.

Degree Requirements

Grading and honors policies as stated in this catalog apply to all undergraduate students.

Other requirements in this catalog apply to students who enter the University between July 1, 1980, and June 30, 1981. (Students who entered the University at an earlier time but who wish to change to the requirements of this catalog must apply to the appropriate office for the change. Students will be held responsible for all work required for graduation and for the scheduling of all necessary courses.

Modifications tend to occur in major programs during the four-year period of students' undergraduate careers. Students are expected to conform to these changes insofar as they do not represent substantive alterations in their course of study.

Bachelor of Arts

1. At least 128 credits with a minimum cumulative grade-point average of 2.00 in all courses completed at the University of New Hampshire.

2. Completion of the University General Education Requirements. This is intended to insure that all students receiving the Bachelor of Arts degree acquire reasonable exposure to and learning in the arts and humanities, social sciences, and natural sciences.

3. Proficiency in a foreign language at the level achieved by satisfactory work in a one-year, college-level course. This requirement may be fulfilled by achieving a score of 500 or better on a College Board foreign language achievement test, or by completing a full-year elementary course in any foreign language, or by completing a semester of a course in a foreign language beyond the elementary year. This requirement must be satisfied by the end of the sophomore year.

4. Satisfaction of major requirements by completing at least 32 credits of major coursework with grades of C– or better and a grade-point average of 2.00 or better. A major may require a senior paper or project and/or a comprehensive examination.

Bachelor of Fine Arts, Bachelor of Music, Bachelor of Science

Requirements for the B.F.A. degree are on page 33; for the B.M. degree, on page 33; and for the B.S. degree, on pages 34,36, and 45.

Associate in Arts

1. Completion of at least 64 credit hours within a minimum grade-point average of 2.00 based on a 4.00 scale.

2. Completion of General Education Requirements as follows:

Group I Two courses, each of which must carry at least three credits, from the following areas:

a. biological sciences
b. physical sciences and mathematics

Group II Three courses, each of which must carry at least three credits, from the following areas:

c. arts and humanities
d. social sciences

Students are required to elect at least one course each in both c and d.

Group III Three courses, one of which may be freshman English (required for graduation) and each of which must carry at least three credits, from all courses offered by the University, including those in Groups I and II.

Courses that may be used to meet Group I and Group II requirements are listed on page 13.

The Division of Continuing Education may prescribe up to four of the eight courses used to satisfy the General Education Requirements. A minimum of four courses is to be freely elected by the student. Courses taken to satisfy General Education Requirements may not be in the student's declared career option.

A University freshman English course in reading and composition (English 401) is required of all undergraduates. The freshman English course may not be used to satisfy the arts and humanities requirement in general education.

3. The remaining courses or credits may be earned in a career option and/or in elective general education courses.

4. The last 16 hours of credit must be completed through the Division of Continuing Education at UNH following admission and matriculation, unless permission is granted to transfer part of this work from another institution.

Dual Degrees

The opportunity to pursue simultaneously two undergraduate degrees enhances and broadens the education of certain students. The program is only for those students who can adequately handle the requirements for two different degrees and who can reasonably allocate the additional time and effort needed for the program.

Requirements

1. Students desiring dual degrees must petition the college dean or deans involved for permission.

2. Students planning to take one degree in a highly prescribed curriculum should register as freshmen in the appropriate school or college for that curriculum.

3. It is expected that candidates for two degrees will complete 32 credits beyond those required for the first degree.

4. The two degrees, as awarded by the University of New Hampshire, must be different (e.g., B.A. and B.S., or B.S. and B.S. in Chemistry). Transfer students already holding a baccalaureate degree from another accredited institution may pursue an additional baccalaureate degree at the University of New Hampshire provided they fulfill the previously listed requirements. The degree received at the first institution will be accepted by UNH as awarded by that institution.

Supervision As soon as a student is accepted as a candidate for two degrees, the appropriate dean(s) will appoint supervisors for each of the proposed majors. The supervisors and the student will work out a basic course plan for the two degrees and inform the appropriate dual degree dean(s) of the plan. The supervisors will maintain joint control over the student's academic program. The college offices and the supervisors will receive copies of grade reports and other records for students pursuing two degrees.

Minimum Graduation Average

A cumulative grade-point average of 2.00 is the minimum acceptable level for undergraduate work in the University and for graduation. The Academic Standards and Advising Committee examines the records of students periodically and may

16

Majors and Minors

place academically deficient or potentially deficient students on warning, or may exclude, suspend, or dismiss those who are academically deficient.

Quota of Semester Credits

Students registering for more than 20 credits must receive the approval of the college dean.

Undergraduates are assigned class standing on the basis of semester credit hours of academic work completed with a passing grade, as follows: to be a sophomore—26 credit hours; to be a junior—58 credit hours; to be a senior—90 credit hours.

Residence

Students who are candidates for a bachelor's degree must attain the last one-quarter of total credits for the degree in residence unless granted permission by the Academic Standards and Advising Committee to transfer part of this work from other accredited institutions.

Withdrawal from the University

Students who leave the University are expected to file formal withdrawal notification with the registrar.

Note: Although the University will try to provide sufficient facilities so that students may pursue any major or curriculum for which they meet the requirements, such a privilege cannot be guaranteed, since rapidly increasing enrollment sometimes results in the overcrowding of required specialized courses. On occasion, students may remain in a crowded curriculum if they are willing to take certain courses during the summer session.

Majors are described under their various schools and colleges, and a few that are intercollege are described in the section on "Special University Programs."

Student-Designed Majors

See page 72 for requirements for a student-designed major.

Second Majors

Students may choose to fulfill the requirements of two dissimilar major programs, provided they obtain the approval of their principal adviser and the dean(s) of the college(s) in which the programs are offered, and comply as follows:

1. If the two majors are offered in different schools or colleges within the University, the admissions requirements of each must be satisfied.
2. If the two majors have two distinct degrees, e.g., B.A., B.S., or some other designated degree, students must choose which of the two is to be awarded and fulfill all requirements for that degree.
3. No more than eight credits used to satisfy requirements for one major may be used as requirements for the other major.

Minors

Students may earn a minor in any undergraduate discipline designated by the University. A list of minors is available from the advising coordinator in each college or school. Students must consult with the major adviser and the minor supervisor. A minor consists of 20 semester hours with C− or better and a 2.00 grade-point average in courses that the minor department approves. Courses taken on the pass/fail basis may not be used for a minor. No more than eight credits used to satisfy major requirements may be used for the minor. Students should declare an intent to earn a minor as early as possible and no later than the end of the junior year. During the final term, an application should be made to the dean to have the minor shown on the transcript.

Bachelor's degree students interested in obtaining a minor or concentration in a career option offered by the Division of Continuing Education should see pages 75 and 76.

Abbreviations

Department Abbreviations

The following abbreviations are used to identify undergraduate and graduate courses offered at the University. An asterisk preceding the letters identifies those disciplines in which graduate programs are offered.

College of Liberal Arts

Anth	Anthropology
Arts	The Arts
*Biol	Biology
Clas	Classics
*Educ	Education
*Engl	English
Fren	French
Geog	Geography
*Germ	German
Grek	Greek
*Hist	History
Huma	Humanities
Ital	Italian
Latn	Latin
Ling	Linguistics
*Micr	Microbiology
*Musi	Music
*MuEd	Music Education
Phil	Philosophy
*Polt	Political Science
*Psyc	Psychology
R S	Religious Studies
Russ	Russian
ScSc	Social Science
S S	Social Service
*Soc	Sociology
*Span	Spanish
ThCo	Theater and Communication
W S	Women's Studies
*Zool	Zoology

School of Health Studies

*Comm	Communication Disorders
HAP	Health Administration and Planning
MedT	Medical Technology
Nurs	Nursing
O T	Occupational Therapy
*PhEd	Physical Education
RecP	Recreation and Parks
SHS	School of Health Studies

Whittemore School of Business and Economics

*Admn	Administration
*Econ	Economics
Hotl	Hotel Administration
Secr	Secretarial Studies

College of Life Sciences and Agriculture

*AnSc	Animal Sciences
*Bchm	Biochemistry
*Bot	Botany and Plant Pathology
*Ento	Entomology
*FoRs	Forest Resources (INER)
*HEc	Home Economics
*Hydr	Hydrology (INER)
*INER	Institute of Natural and Environmental Resources
*OcEd	Occupational Education
*PlSc	Plant Science
*REco	Resource Economics (INER)
*Soil	Soil Science (INER)

College of Engineering and Physical Sciences

*ChE	Chemical Engineering
*Chem	Chemistry
*CiE	Civil Engineering
*C S	Computer Science
*ESci	Earth Sciences
*E E	Electrical and Computer Engineering
E T	Engineering Technology
*Math	Mathematics
*M E	Mechanical Engineering
*Phys	Physics
*Engr	Engineering Ph.D.
Tech	Technology (nondepartmental)

Separate Departments and Programs

Aero	Aerospace Studies
DCE	Division of Continuing Education (all courses)
*Gen	Genetics Program
Inco	Intercollege
Milt	Military Science
TSAS	Thompson School of Applied Science

18

Degrees and Major Programs of Study

Colleges

College of Liberal Arts

The Teacher Education division of the College of Liberal Arts coordinates the five-year graduate/undergraduate teacher education program. See page 21.

Bachelor of Arts
Anthropology
The Arts
  Art Studio
  Art History
Classics
Communication
English
English Teaching
French
Geography
German
Greek
History
Humanities
Latin
Linguistics
Microbiology
Music
  Music History
  Performance Study
  Music Theory
  Preteaching
Philosophy
Political Science
Psychology
Russian
Social Work
Sociology
Spanish
Theater
Zoology

Bachelor of Fine Arts

Bachelor of Music
  Piano
  Organ
  Voice
  Strings, Woodwind, Brass, or Percussion
  Theory
  Music Education

Bachelor of Science
Biology

College of Life Sciences and Agriculture

Bachelor of Arts
Botany and Plant Pathology
Entomology

Bachelor of Science
Animal Sciences
  Animal Sciences
  Preveterinary Medicine
Biochemistry
Biology
Botany and Plant Pathology
Entomology
General Studies
Home Economics
  Child-Family Studies
  Consumer Studies
  Home Economics Education
  Human Nutrition and Dietetics
Occupational Education
Plant Science
  Science
  General
(within the Institute of Natural and Environmental Resources)
Community Development
Environmental Conservation
Hydrology
Resource Economics
Soil Science
Wildlife Management

Bachelor of Science in Forestry
(within the Institute of Natural and Environmental Resources)
Forest Resources
  Forest Management
  Forest Science
  Wood Science
  Quantitative Science

Schools

College of Engineering and Physical Sciences

Bachelor of Arts
Chemistry
Chemistry and Physics Teaching
Earth Science Teaching
Geology
Mathematics
Physics
Science

Bachelor of Science
Chemical Engineering*
  Energy
  Environmental Engineering
Chemistry*
Civil Engineering*
  Environmental Engineering
  Constructed Systems
Computer Science*
Electrical Engineering*
  Computer Engineering
  Electrical Engineering Systems
  Electrical Engineering Science
Geology*
Mathematics*
Mathematics Education*
  Elementary
  Secondary
Mathematics (Interdisciplinary)
  Mathematics—Chemistry
  Mathematics—Computer Science
  Mathematics—Economics
  Mathematics—Electrical Science
  Mathematics—Fluid Dynamics
  Mathematics—Mechanics
  Mathematics—Thermodynamics
  Mathematics—Physics
Mechanical Engineering*
  Energy
Physics*

Bachelor of Engineering Technology
Electrical Engineering Technology
Mechanical Engineering Technology

Whittemore School of Business and Economics

Bachelor of Arts
Economics

Bachelor of Science
Administration
Hotel Administration

School of Health Studies

Bachelor of Science
Communication Disorders
Health Administration and Planning
Medical Technology
Nursing
Occupational Therapy
Physical Education
  Teacher Certification
  Athletic Training
  Exercise Specialist in Health Maintenance
  Pre-Physical Therapy
  Sports Communication
Recreation and Parks
  Recreation Administration
  Park Management

Thompson School of Applied Science, of the College of Life Sciences and Agriculture

Associate in Applied Science
Applied Animal Science
Applied Business Management
Applied Plant Science
Civil Technology
Food Services Management
Forest Technology

Other Programs

Division of Continuing Education

Associate in Arts in General Studies
Career Options:
  Accounting
  Banking
  Criminal Justice
  Insurance
  Library Science
  Management
  Merchandising
  Quality Control
  Real Estate
  Traffic and Distribution Management

Five-Year Degree Programs

Bachelor of Arts and Master of Business Administration
Bachelor of Science and Master of Business Administration
Bachelor of Arts and Master of Education
Bachelor of Science and Master of Education

Interdisciplinary Minors**

Biomedical Systems and Instrumentation
Environmental Engineering
History and Philosophy of Science
International and Foreign Area Studies
Ocean Engineering
Oceanography
Religious Studies
Women's Studies

Advisory Committees

Genetics
Interdepartmental Biology
Prelaw
Premedical-Predental

The Graduate School

Master of Arts
Master of Science
Master of Arts in Teaching
Master of Business Administration
Master of Education
Master of Occupational Education
Master of Public Administration
Master of Science for Teachers
Certificate of Advanced Graduate Study
Doctor of Philosophy

*Designated degree
**For other interdisciplinary programs, see pages 71–75.

20 College of Liberal Arts

Allan Spitz, Dean
Melville Nielson, Associate Dean
James A. Smith, Associate Dean
Judith M. St. Lawrence,
Acting Assistant Dean
Donna B. Brown, Assistant to the Dean
George T. Abraham, Academic Counselor
Jean Carlson, Academic Counselor

Divisions and Departments

Biological Science Division
Microbiology Department
Zoology Department

Humanities Division
Ancient and Modern Languages and Literatures Department
The Arts Department
English Department
Music Department
Philosophy Department
Theater and Communication Department

Social Science Division
Geography Department
History Department
Political Science Department
Psychology Department
Social Service Department
Sociology and Anthropology Department

Teacher Education Division
Education Department

Programs of Study

Bachelor of Arts
Anthropology
The Arts
- Art Studio
- Art History

Classics
Communication
English
English Teaching
French
Geography
German
Greek
History
Humanities
Latin
Linguistics
Microbiology
Music
- Music History
- Performance Study
- Music Theory
- Preteaching

Philosophy
Political Science
Psychology
Russian
Social Work
Sociology
Spanish
Theater
Zoology

Bachelor of Science
Biology

Bachelor of Fine Arts

Bachelor of Music
- Piano
- Organ
- Voice
- Strings, Woodwind, Brass or Percussion
- Theory
- Music Education

Purpose and Programs

It is the purpose of the College of Liberal Arts, as a center of learning and scholarship, to help students achieve an understanding of the heritage of civilization and to educate them in the tradition of the past and realities of the present so that they may recognize and act upon their obligations to the future.

The college seeks to meet the educational needs of each student through the development of interests and skills which, combined with the individual's potential, makes possible the living of a richer, more useful life.

Degrees

The College of Liberal Arts offers four degrees: Bachelor of Arts, Bachelor of Science, Bachelor of Fine Arts, and Bachelor of Music.

Bachelor of Arts These programs primarily provide a broad liberal education along with a major in one of the fields listed on the previous page. Requirements for the Bachelor of Arts degree and information regarding these majors are presented on page 15.

The Bachelor of Science This curriculum consists of an interdepartmental program in biology which permits students considerable specialization while providing them with a broad cultural education. Requirements for the Bachelor of Science degree and information regarding the biology curriculum are presented on page 34.

The Bachelor of Fine Arts This curriculum provides training for students who plan to enter a professional graduate school. Requirements for the Bachelor of Fine Arts degree are outlined on page 33.

The Bachelor of Music This curriculum provides professional training in applied music, in musical theory, and in music education, and allows students to develop their talent to a standard equivalent to the one achieved at conservatories of music. Requirements for the Bachelor of Music degree and information regarding the curriculum are presented on pages 33–34.

Five-Year Program: B.A.-M.B.A.

The College of Liberal Arts and the Whittemore School of Business and Economics offer a combined five-year program leading to a B.A. degree in French, history, philosophy, or psychology and an M.B.A. degree. Information about the program can be obtained from the department or from the undergraduate counselor in the Whittemore School.

Combined Programs of Study

In addition to pursuing a single major, students may combine programs of study as follows.

Minors: See page 16 for requirements. See also Interdisciplinary Minors, pages 22 and 45.
Second Majors: See page 16 for requirements.
Dual-Degree Programs: See page 15 for requirements.
Student-Designed Majors: See page 72 for requirements.

Other combined programs and interdisciplinary opportunities are described in Special University Programs, pages 71–75.

Preparing for Teaching

The teacher education programs at the University are accredited by the New Hampshire State Department of Education and by the National Council for the Accreditation of Teacher Education. UNH participates in the Interstate Certification Compact; consequently, completion of the approved teacher preparation program of the University qualifies students for certification as teachers in most states.

UNH offers approved programs in agriculture, art, biology, chemistry, earth sciences, elementary education, English, French, German, home economics, Latin, mathematics, music, occupational education, physical education, physics, preschool education, social science, Spanish, speech therapy, and theater and communication.

Five-Year, Undergraduate-Graduate Program

The major avenue for becoming certified to teach at the elementary, middle, or high school level is an integrated undergraduate-graduate program culminating in a fifth-year, year-long internship. Before the internship, students earn a bachelor's degree outside the field of education. The internship offers 6-12 graduate credits, which students usually couple with other graduate work leading to a master's degree. A number of UNH master's degree programs may be elected, including two offered by the Department of Education that are specifically designed for preservice teaching. (See Graduate Catalog for description.)

Step 1. Register for Educ 500 (preferably in sophomore year).

Educ 500, Exploring Teaching, provides an early experience in the schools as a teacher aide and teaching assistant. Students may select this four-credit course at any time; however, most should choose it before completing their sophomore year. Working side by side with experienced teachers, students explore various teaching roles so that they may make realistic decisions about teaching as a career.

Step 2. Apply to the Department of Education for admission to the second phase of the teacher education program and for a co-adviser from that department, who will provide assistance in designing the most appropriate plan of studies. The plan must include a minimum of four credits in each of four areas of study: Educ 700, Educational Structure and Change; Educ 701, Human Learning and Development; Educ 703, Alternative Teaching Models; and Educ 705, Alternative Perspectives on the Nature of Education. Since there is no undergraduate major in education, students must complete a major in another department for a baccalaureate degree.

A number of variable-credit modules are available to students in each of the required four course areas, including experiences and workshops in local schools. Certain courses in other departments may be substituted for these requirements. Working closely with advisers, students may develop highly individualized programs,

choosing from many alternatives. Since credit in these four areas of study may be taken at either the undergraduate or graduate level, students have greater flexibility for fulfilling the requirements of their college and major departments.

Additional requirements for elementary school teaching include one course in elementary school reading (Educ 706, Introduction to Reading Instruction in the Elementary Schools) and two courses in mathematics appropriate for elementary school teaching (recommended—Math 621, Number Systems for Elementary School Teachers; Math 622, Geometry for Elementary School Teachers; Math 623, Topics for Elementary School Teachers; 703, Mathematics Education, K-6).

Step 3. Apply for admission to the fifth-year internship and master's degree program.

The final phase of the teacher education program consists of a year-long internship (Educ 800-801). **Students must apply for the fifth-year internship and master's degree program by September 15 of their senior year** so that they will have enough time to explore a variety of career and/or graduate study options and conclude their program plans before second semester of that year. Opportunities exist for admitted graduate students to take courses toward their master's degree in the second semester of their senior year.

Before the internship, students will have completed a B.A. or B.S. program with a major outside the field of education. They will have, therefore, a broader general education and greater depth in their area of specialization, as well as opportunities for jobs outside of education. For secondary school certification, students must have completed an approved major program, or its equivalent, in the subject they intend to teach. Candidates for elementary school certification may choose from any of the majors offered at the University.

If accepted into the internship and master's degree program, students have several options from which to choose, including selection of additional courses for further specialization, and selection of workshops and courses offered for credit in intern-site schools. During the internship, students have an opportunity to work with resident supervisors and other interns in various team-teaching arrangements.

Financial Aid A limited number of paid internships are available. Students are hired by participating school districts. Other financial assistance is possible through the Office of Financial Aid.

Criteria for Admission to Fifth Year To be eligible for an internship, students must satisfy the following criteria: 1) favorable rating from school personnel who have worked with them in Exploring Teaching and in any other clinical experience; 2) favorable rating from UNH staff supervising Exploring Teaching and other clinical experience; 3) favorable recommendation from instructors of professional coursework; 4) favorable recommendation from their major program, including approval of the major program as appropriate for secondary school teaching; 5) admission to the UNH Graduate School, which requires a minimum of 2.50 cumulative grade-point average, Graduate Record Examination scores, and appropriate letters of recommendation; 6) available space in the program.

For further information, contact Stephen R. Birrell, coordinator of teacher education.

Undergraduate Certification Option

Because of the professional orientation of majors in occupational education, home economics, physical education, preschool education, and music education, an undergraduate option for teacher certification in these areas may be elected. This option requires the same professional education components listed previously, with the election of one semester of student teaching (Educ 694) instead of the year-long internship.Successful completion of Educ 500 and positive recommendation from school-site staff are required for further professional work. Final screening takes place before the student-teaching semester. Application for acceptance into student teaching must be filed by February 15 of the junior year.

Academic standards for admission to the option include a minimum 2.50 grade-point average in the major and a minimum 2.20 cumulative grade-point average at the time of application for student teaching.

These programs have limited capacity, and admission to the University or satisfaction of minimum academic standards as stated previously does not guarantee admission to the teacher education programs.

For further information, contact Stephen R. Birrell, coordinator of teacher education.

Interdisciplinary Minors

History and Philosophy of Science Minor

This interdisciplinary minor is designed for students who wish to study the historical and philosophical foundations of the natural and social sciences. It may be combined with any undergraduate major field. General introductions to any of the disciplines are not among the goals; rather, the objective is to acquire skills in historical thinking and critical analysis relevant to the discovery, growth, and application of scientific knowledge.

Further information is available from the Advising Center, Murkland Hall, including annual listings of the courses and instructors. Any instructor teaching one of the courses may serve as a contact person. A minor consists of any five of the courses listed, with no more than three from any single department.

Hist 521. History of Science (to the Renaissance)
Hist 522. History of Science (post-Renaissance)
Hist 722. History of American Thought
Hist 751. European Intellectual History
Hist 752. European Intellectual History
Hist 789. Seminar in the History of Science
Phil 424. Science, Technology, and Society
Phil 435. The Human Animal
Phil 630. Philosophy of the Natural Sciences
Phil 683. Technology:Philosophical and Ethical Issues
Phil 725. Philosophy of the Social Sciences
Phil 780. Special Topics in Philosophy*
Psyc 471. The Great Psychologists
Psyc 591. Special Topics in Psychology*
Psyc 671. History of Psychology
Psyc 771. Survey of Twentieth-Century Psychology

*with approval

International and Foreign Area Studies Minor

This minor, designed to meet the needs of undergraduates who wish to pursue their studies with an international or an area focus, provides interdisciplinary support for students' major interests. Students interested in this minor should consult the minor requirements in their respective colleges and schools. The program is administered by an international studies minor supervisor.

A minor in international and foreign area studies consists of 20 credits (normally five courses) and knowledge of a foreign language. Courses that may be applied toward this minor are listed in the *Bulletin for International and Foreign Area Studies Minors,* which is available from the international studies minor supervisor. For approval of the minor, students must meet the following requirements:

1. Complete a minimum of one and a maximum of two courses from a list of general international courses.
2. Select a foreign area from among the six offered (Asia, West Europe, Soviet and East Europe, Africa and the Middle East, Canada, Latin America) and complete a minimum of three and a maximum of four courses from among those listed for that area.
3. Demonstrate knowledge of a foreign language relevant to the selected geographic area. This requirement will ordinarily be met by one of the following:
   a. Successful completion of the following courses in a language relevant to the area: Fren 504 or 514; Germ 504; Ital 504; Portuguese (see "c"); Russ 504; or Span 504.
   b. Successful completion of courses taught in the relevant language above the level of the courses listed in "a."
   c. Certification by the language department concerned. Students who select an area in which no relevant language is currently being offered or students with a knowledge of a foreign language not offered in University language programs should contact the international studies minor supervisor.
4. No more than two courses from any one department may be applied toward the minor.
5. With the approval of the international studies minor supervisor, courses taken during the junior year abroad (Salzburg, Austria; Dijon, France; or Valencia, Spain) can be counted toward the minor.

For further information students may contact: Associate Professor B. Thomas Trout, Department of Political Science, international studies minor supervisor.

Religious Studies Minor

The religious studies minor offers a scholarly investigation and analysis of various religious phenomena in a multidisciplinary and cross-cultural manner. Included are such approaches as comparative religion, history of religion, philosophy of religion, psychology of religion, sociology of religion, and religious literature. It entails no sectarian or theological bias. It uses a number of scholarly methods and tools to investigate various religious traditions, as well as such cross-cultural aspects of religion as prayer, belief, mythology, male and female images and roles, ritual, scripture, sectarianism, religious movements, religion and society, and religion and politics.

Students minoring in religious studies must take a survey of world religions (presently provided by Philosophy 416: Philosophical Survey of World Religions), Religious Studies 501 (Contemporary Approaches to the Study of Religion), Religious Studies 699 (Senior Seminar), and the equivalent of two other 4-credit courses—for a total of at least 5 courses, one of which must be at the 600 or 700 level. The two "other" courses may include Religious Studies 599 (Special Topics) and Religious Studies 695, 696 (Independent Studies), or any additional course accepted for the minor by the Religious Studies Executive Board. Currently, such acceptable courses include the following:

Engl 518 The Bible as Literature
Hist 575 The Ancient Near East
Hist 739, 740 Three Medieval Civilizations
Hist 742 The Age of Reformation
Hist 761, 762 England in the Tudor and Stuart Periods
Hist 763 Russia: Origins to Modernization
Hist 791 Religion in World History
Phil 417 Philosophical Reflections on Religion
Phil 520 Introduction to Eastern Philosophy
Phil 571 Medieval Philosophy
Phil 710 Philosophy of Religion
Anth 616 Anthropology of Religion
Anth 732 Area Studies in Archaeology: Near East
Soc 797 Special Topics: Q—Religious Movements; S—Cults and Sects

Students wishing to minor in religious studies or who wish more information should consult with the coordinator, Professor Paul Brockelman, Hamilton Smith 44.

Women's Studies Minor

The women's studies minor provides students with an interdisciplinary introduction to the status of women in various cultures and historical eras, as well as to the contribution of women to various fields of endeavor. In addition, women's studies courses offer students a critical perspective on such basic questions of the social order as assumptions about gender roles and gender identity.

For the women's studies minor, students must complete 20 credits of women's studies courses. These should include W S 401, Introduction to Women's Studies, and W S 698, Senior Seminar, normally taken at the beginning and end of the course sequence, respectively. In between, students should select other women's studies courses or courses from departmental offerings that have been designated women's studies courses or that have the approval of the women's studies coordinator.

Other women's studies courses are WS 595, Special Topics in Women's Studies, and WS 795, Independent Study.

Departmental offerings include the following regularly repeated courses:

Admn 780 Women in Management
Anth 625 Female, Male, and Society
Engl 585 Introduction to Women in Literature
Engl 586 Introduction to Women Writers
Engl 685 Women's Literary Traditions
Engl 785 Major Women Writers
ThCo 567 Images of Women in Media
S S 701 Women and Aging

24

Bachelor of Arts Programs

Students may complete the minor requirements by selecting from other courses that are offered occasionally by the departments. In the past, such offerings have included the following: Psyc 591, Psychology of Women; Econ 698, Women and Work; Phil 496, Women and Philosophy; ThCo 695, The Rhetoric of the Feminist Movement; and others.

Students who wish to minor in women's studies should consult with the coordinator, Dr. Josephine Donovan, 19 Murkland Hall.

The Bachelor of Arts program provides a broad liberal education with a concentration involving a minimum of 32 credits in a major field.

Bachelor of Arts Degree Requirements See page 15 for requirements.

Majors in the Bachelor of Arts Program in the College of Liberal Arts A department may specify certain (but not more than 13) required courses. Students must declare a major before the beginning of the junior year.

The objectives, opportunities, and department requirements of the majors in the Bachelor of Arts program are described in the paragraphs that follow.

Anthropology

The anthropology major, offered by the anthropology section of the Department of Sociology and Anthropology, provides an introduction to the various branches of anthropology and an appreciation of its place among other academic disciplines. At the same time, the major is designed to encourage intensive study of particular topics within the field, according to the interests and talents of students. It is intended to provide both a broad basis for the education of general students and to offer sufficient background for those who may wish to pursue a career in anthropology at the graduate level.

Majors must complete a minimum of 32 credits with grades of C– (1.67) or higher and a grade-point average of 2.00 or better, distributed as follows: Anth 411, 412, either 516 or 518, one topical course, one ethnographic-area course, and any other three courses in anthropology or related disciplines approved by the supervisor.

Students wishing to major in anthropology should consult with Associate Professor Richard E. Downs.

Departmental Honors Honors in anthropology will be awarded to those students who achieve, in addition to the regular requirements of the major, at least a 3.67 grade-point average in courses counted toward the major and satisfactorily complete a four-credit senior thesis under the guidance of a faculty member. A 3.50 overall average is also required. Students wishing to work for honors should inform the undergraduate committee of their intent during the second semester of their junior year, appending their academic record and a statement of the area in which they intend to write a thesis.

The Arts

The courses offered by the Department of the Arts provide an opportunity, within the liberal arts framework, for serious art students to acquire a thorough knowledge of the basic means of visual expression, to acquaint themselves with the history of art, or to prepare themselves for a career in art teaching. In addition, these courses are designed to offer foundation experience for students who are interested in art but are majoring in other departments in the University. The Department of the Arts offers programs leading to a Bachelor of Fine Arts degree (see page 33) and a Bachelor of Arts degree. Certification for art teaching in the public schools is also offered in cooperation with the Department of Education (see Preparing for Teaching, Page 21).

The arts major leading to a Bachelor of Arts degree is offered with two options: studio and art history.

Candidates applying for the arts major, art studio option, or the Bachelor of Fine Arts program are required to submit a portfolio. There is no portfolio requirement for those entering the art history option of the arts major. The University reserves the right to retain selections from a student's work for a period of not more than two years.

Art Studio Option Students selecting the art studio option must complete a minimum of 11 courses (44 credits), of which the following are required: Arts 432 (Drawing I); one course from the following: Arts 501 (Ceramics I), Arts 513 (Jewelry and Metalsmithing I), Arts 525 (Woodworking), or Arts 567 (Sculpture I); two 400-level art history courses; two 500-level art history courses; one elected art history course; three elected studio courses; and one 600-level studio course. The foundation courses (400-level courses) should be completed during the first year.

While these courses represent the minimum departmental requirements for the studio option, students may wish to plan a program involving greater depth in one or several of the studio areas.

Art History Option Students selecting the art history option must complete a minimum of 10 courses (40 credits), of which the following are required: Arts 432, Drawing I; Arts 431, Visual Studies; two additional 400-level art history courses; Arts 696, Methods of Art History; and five additional courses in art history above the 400-level, of which at least two must be in the Ancient and Medieval areas and at least two must be in the Renaissance and Modern areas. Art history majors will receive preferential placement only in the following studio course: Arts 432. Students majoring in art history are strongly advised to take Engl 501, Introduction to Prose Writing, and two foreign languages, one of which should be German.

Art Education Curriculum The program in art education is organized into a five-year, teacher-education sequence.

This curriculum is designed to prepare teachers of art in the public schools. Completion of the B.A. or B.F.A. degree before a fifth-year internship is necessary for teacher certification. The satisfactory completion of the B.A. or B.F.A. curriculum and the fifth-year internship will satisfy the initial certification requirements for teachers of art in the public schools of New Hampshire and in most other states.

Minor in Architectural Studies The minor in architectural studies provides students with an interdisciplinary introduction to the history, theory, and methods of architecture and its symbolism. The program allows students who are interested in this field to receive programmatic recognition for their work. It is designed to assist those who a) are contemplating enrollment at a school of architecture; b) become particularly interested in architectural history; c) want to supplement their technical majors (e.g., civil engineering) with strong academic minors; or d) plan to pursue careers in preservation, education, community service, and public relations.

The minor in architectural studies consists of 20 credits (ordinarily five courses) distributed in the following way:

Two courses in architectural history chosen from
- Arts 485, Studies in Architectural History
- Arts 594, 17th and 18th Century American Architecture
- Arts 595, Early Modern Architecture
- Arts 596, Contemporary Architecture
- Arts 698, Seminar in Architectural History

The course in architectural graphics and design
- Arts 455, Introduction to Architecture

A beginning course in drawing
- Arts 432, Drawing I

An elective chosen in consultation with the program coordinator of the architectural studies minor (an additional course in architectural history, a studio course, or some other appropriate elective)

Admission to the minor will be authorized by the program coordinator. Interested students should consult with the coordinator in advance of selecting the minor.

Classics

The classics major is offered by the classics section of the Department of Ancient and Modern Languages and Literatures. The minimum requirements for a major in classics are: 40 credits offered by the classics section, excluding Latin 401-402. Twenty-four of these must be in courses in Greek and Latin. Students will be encouraged to take courses in related fields such as ancient history, classical art, modern languages, and English.

The supervisor for majors is Associate Professor John C. Rouman.

Departmental Honors The Honors Program in Classics is designed primarily and specifically for students of superior ability, demonstrated achievement, and high interest in the study of both Greek and Latin. Students may apply for admission to the program during their junior year. Applicants must have completed at least: Latin 504 and Greek 504, either Latin 601 or Greek 601, one 700-level literature course in Latin, and one 700-level literature course in Greek. Applicants must have a minimum grade-point average of 3.67 in their Latin, Greek, and classics courses, as well as a 3.50 overall average. Students meeting these criteria may apply to the program by writing to the coordinator for classics and seeking the approval of the classics faculty. Each student admitted to the honors program receives a faculty adviser who is responsible for arranging the student's subsequent program. The faculty adviser will be appointed to teach "Introduction to Classical Scholarship," either Latin 795I or Greek 795P, depending on the student's classical language of primary interest. The honors student must complete satisfactorily an honors thesis and a final oral examination covering aspects of Greco-Roman studies and classical scholarship. In addition to the course in Classical Scholarship, the honors student's total program shall include no less than either four 700-level courses in Greek and two 700-level courses in Latin, or four 700-level courses in Latin and two 700-level courses in Greek, depending on which classical language is the object of the student's primary interest and the focus of the student's research course in Classical Scholarship.

Communication

Communication is one of two majors offered in the Department of Theater and Communication. The major emphasizes a broad, integrative approach to theories and practices of verbal, nonverbal, mass, and other forms of communication. Interdepartmental coursework, reasonable course substitution on an individual basis, proficiency exemption, and field or laboratory work are encouraged to meet individual communication needs or goals. Communication coursework can be readily related to social sciences, humanities, etc., and provides a preprofessional preparation for vocations such as law, public relations, personnel work, mass communication, and cinema.

Majors in communication shall select ten courses (40 hours) distributed as follows: all students are required to take ThCo 402 and 403; a minimum of two courses (eight hours) from each of the three areas of rhetoric and public address, communication studies, and mass communication; and two courses (eight hours) in an area of emphasis determined in consultation with their advisers. The courses applicable to each category are available from the department.

Students interested in majoring in communication should consult with the chairperson of the Department of Theater and Communication. Students wishing to transfer to the University of New Hampshire and major in communication must first have the approval of the department.

English

The Department of English offers two programs of study: the English major and the English teaching major.

The English Major The English major has two chief objectives: to provide all students with a common core of literary experience and to provide each student with the opportunity of shaping a course of study to suit individual interests. The flexibility and freedom inherent in the second of these objectives places a responsibility upon students to devise a program that has an intelligent rationale. For example, students who intend to pursue graduate study in English literature should choose more than the minimum number of advanced literature courses and should seek a broad, historical background. Students with special interests in linguistics or writing may, on the other hand, wish to elect only the minimum number of advanced literature courses required for the major. All students should secure the assistance and approval of their advisers in formulating an early plan for the major program.

The English department offers a journalism program which, though not a major, prepares students to become professional journalists upon graduation. The program consists of five sequential writing courses which students should begin no later than the second semester of the sophomore year. Internships at daily newspapers are available. Students interested in this program should inquire at the departmental office.

For the English major, students must complete a minimum of 32 credits of major coursework including: Engl 519, two additional 500-level courses, and seven courses numbered 600 and above. In selecting these courses, students must be sure to meet the following distribution requirements:

1. Two courses in literature prior to 1800: either two advanced courses (numbered 600 or above), or one advanced course and Engl 513.
2. Two courses in literature since 1800: either two advanced courses, or one advanced course and one course from the following list: Engl 514, Engl 515, Engl 516.

Students interested in majoring in English should consult the chairperson, Professor Jean Kennard.

The English Teaching Major This major is designed for students wishing to teach English in middle or high schools. Completion of this undergraduate major does not in itself, however, meet state certification requirements. To meet these requirements, students should enroll in the undergraduate major and, by September 15 of their senior year, apply for the fifth-year teaching internship and master's degree program. (For a full description of requirements for the integrated under-graduate-graduate program for teachers, and its several options, see the section entitled "Preparing for Teaching," page 21.) Undergraduate English teaching majors must pass the following English courses with an average of 2.50 or better: Engl 512, 514, 519, 619, 657, 712, 718 or 719, 791-792, and two additional literature courses numbered above 700. Engl 513 may be substituted for the second 700-level course.

Students who are interested in majoring in English teaching should contact Professor Thomas Carnicelli.

French

The French major is offered through the French section of the Department of Ancient and Modern Languages and Literatures. In addition to its value in the context of the liberal arts, the major provides knowledge of the language, literature, and culture of France which is useful in a number of careers, such as teaching, business, law, and social service. Prospective teachers should consult the section on "Preparing for teaching," page 21. Students interested in nonteaching careers are urged to consult with the French section and with other appropriate departments early in their academic careers. Special attention is called to courses in administration offered through the Whittemore School.

A *major* consists of a minimum of 36 credits. Fren 401-402, 501, 503-504, 514, 516, 621, and 622 do not count toward a major. Fren 605-606 and 790 are required of majors. Majors are encouraged to take courses in the literatures of other countries as well as in fields such as music, art, philosophy, history, political science, and sociology which provide insight into nonliterary aspects of culture. A *minor* in French consists of 20 credits in French courses numbered 501 and above (but students may not count both 501 and 503 toward the minor). The coordinator of French supervises the work of both majors and minors.

The French section also offers a junior year abroad at the University of Dijon. This program is open to all qualified students at the University of New Hampshire. See Description of Courses, Fren 685-686. Early consultation with the section is urged.

Five-Year, Dual-Degree Program in French and Business Administration The dual-degree program permits students to earn both a B.A. in French and an M.B.A. in business administration in five years instead of the normal six. All requirements for both the French major and the M.B.A. program offered by the Whittemore School of Business and Economics will be met. A maximum of 16 credits may be counted toward both degrees. Students interested in this program should consult with the departmental adviser to the program early in their sophomore year.

Geography

Geography is best defined as the discipline that describes and analyzes the variable character, from place to place, of the earth as the home of man. As such, geography is an integrating discipline, studying many aspects of the physical and cultural environment that are significant to understanding the character of areas or the spatial organization of the world.

Because its integrating character establishes common areas of interest with many other fields of knowledge, geography is an excellent core discipline for a liberal education. Thus, students who have a primary interest in the spatial organization or the regional character of the world and who also desire a liberal education can attain these goals by majoring in geography. Those wishing to prepare for careers as professional geographers are advised to concentrate their coursework in geography and closely related fields, and they should plan to go on to graduate study after completing an undergraduate major in geography.

In addition to teaching and scholarly research, students with degrees in geography have found their education valuable in such fields as regional planning, locational analysis for industry and marketing organizations, cartography, map library work, military intelligence, the foreign service, travel and tourism, and journalism.

Students who major in geography are required to take Geog 401, 402, and seven additional courses in geography or related fields approved by their supervisor to a total of 28 semester credits. The seven courses should include Geog 570, 572; 581, 582; 797; and two additional intermediate-level courses in geography.

A minor consists of five courses (20 credits) in geography.

Students interested in majoring in geography should consult with the supervisor, Professor William H. Wallace.

German

The German major is offered by the German section of the Department of Ancient and Modern Languages and Literatures. This program is designed to be of interest to the following groups of students:

1. Those who have a special interest in the German language, literature, and culture.
2. Those who intend to enter fields in which a background in foreign languages and literatures is desirable. Examples are: international banking, trade, science, government service, and library science.
3. Those who plan to teach German in secondary schools. Since most secondary schools require their teachers to teach more than one subject, students planning to enter teaching at this level must plan their programs carefully. They should combine a major in one of the languages and its literature with a minor or at least a meaningful sequence of courses in another subject.
4. Those who intend to pursue graduate study in Germanic linguistics and literature. Such graduate study is an essential prerequisite for teaching and research at the university level.

The German section offers a junior year abroad at the University of Salzburg. This program is open to all qualified students at the University of New Hampshire. See Description of Courses, Germ 685-686.

A major must include a minimum of 32 credits in German language, literature, and culture beyond Germ 504. Germ 525, 526, 601, 602 (or their equivalents), and twelve other credits on the 700 level (excluding 791) earned in Durham are required for all majors. Achievement examinations will be given at the end of the junior and senior years.

Greek

The Greek major is offered by the classics section of the Department of Ancient and Modern Languages and Literatures. The supervisor for majors is the coordinator for classics, Associate Professor John C. Rouman.

The minimum requirements for a major in Greek are: 32 credits in Greek, including Grek 401-402. Students are encouraged to take courses in related fields such as Latin, classics, and ancient history.

For the Honors Program in Classics, see page 25.

History

Students majoring in history must complete 32 credits in history courses numbered 500 or above with a grade of C– or better and an overall average in these courses of 2.00 or better. These courses must include a minimum of one semester-course each from Groups I, II, and III listed in the Description of Courses. At least four semester-courses of the total must be numbered 700 or above. This must include Hist 797, Colloquium in History, which all senior history majors are required to complete. History majors must complete Hist 500, Introduction to Historical Thinking, in the semester following declaration of major. For transfer students, a minimum of four of the semester-courses used to fulfill the major requirements must be taken at the University of New Hampshire and at least two of these must be numbered 700 or above.

Students intending further work in history beyond the bachelor's degree are urged to take Hist 775, Historical Methods.

Students intending to major in history should consult with the chairperson of the department's undergraduate committee. Suggested programs for students with special interests or professional plans are available in the department office.

Five-Year, Dual-Degree Program in History and Business Administration The dual-degree program permits students to earn both a B.A. in history and an M.B.A. in business administration in five years instead of the normal six. All requirements for both the history major and the M.B.A. program offered by the Whittemore School of Business and Economics will be met. A maximum of 16 credits may be counted toward both degrees. Students interested in this program should consult with the history department adviser early in their sophomore year.

Humanities

The major in humanities allows students to design and pursue under faculty guidance a coherent interdisciplinary program in the humanities (art, drama, language, literature, music, philosophy). The student defines the subject and selects a program of

28

related courses. The subject may be a historical period or any other topic that may be explored through several disciplines in the humanities. The program must have clear educational and intellectual merit and prepare the student to undertake a senior project of at least four credits on the subject (Huma 699). The program must be sponsored by a faculty member from the Humanities Division and approved by the Executive Committee of the division.

Students who wish to become humanities majors should submit a formal proposal to the committee by the end of the sophomore year. Normally, students should have a grade-point average of at least 2.70. Students should select most of the courses for the program from those offered for major credit by departments within the Humanities Division, but are also encouraged to include courses from outside the division (especially from history) when they are appropriate to the major subject. The number of courses in the program may vary, but at least 32 credits of major coursework must be completed.

Before submitting formal proposals, interested students are urged to seek the advice of committee members and other faculty in the Humanities Division. Inquiries about the humanities major should be directed to Professor Charles Leighton, supervisor of the Humanities Major Program, Department of Ancient and Modern Languages and Literatures.

Latin

The Latin major is offered by the classics section of the Department of Ancient and Modern Languages and Literatures. The supervisor for majors is the coordinator for classics, Associate Professor John C. Rouman.

The minimum requirements for a major in Latin are: 32 credits in Latin, excluding Latn 401-402. Students are encouraged to take courses in related fields such as Greek, classics, and ancient history.

For the Honors Program in Classics see page 25.

Linguistics

Linguistics is the study of one of the most important characteristics of human beings: language; it cuts across the boundaries between the sciences and the humanities. The program is an excellent liberal arts major or preprofessional major for law, medicine, clergy, and others. Dual majors with a foreign language, business administration, and the like, are quite feasible.

The program is based on 32 credits of linguistics courses, four core courses and four additional area courses. The language requirement is: two years of college study (or equivalent) of one foreign language and one year of a second language from a different language family or subfamily.

A minor in linguistics consists of four core courses, and two additional courses from the area courses.

Students interested in the major or the minor should consult with the program director, program secretary, or with any professor who teaches linguistics courses. To declare a major in linguistics, students must first submit a proposal, signed by a faculty sponsor, to the Linguistics Committee. Information is available from the Advising Center, Murkland Hall.

Core Courses

Students must take a total of four core courses. (Titles are given below under the departments.)

Introductory courses: Ling 505 and Ling 506; both are required.

Syntax and Semantics: ThCo 572; Psyc 712; Phil 745; Engl 794; one is required.

Phonetics and Phonology: Comm 524; Engl 793; one is required.

Area Courses

Anthropolgy: 795-796, Anthropological Linguistics.

Classics: 595-596 H, Sanskrit; 595, 596, Independent Study; Hittite (by arrangement).

Communication Disorders: 524, Applied Phonetics of American English; 638, The Acquisition of Language.

English: 715, Applied Linguistics; 716, Problems in Applied Linguistics; 719, English Grammar; 752, History of the English Language; 753, Old English; 754, Beowulf; 793, Phonetics and Phonology; 794, Syntax and Semantic Theory.

French: 791, Methods of Foreign Language Teaching.

German: 781, History and Development of the German Language; 791, Methods of Foreign Language Teaching; 795, Special Studies.

Latin: 791, Methods of Foreign Language Teaching; 795, 796, Independent Study.

Linguistics: 795, 796, Independent Study.

Philosophy: 412, Beginning Logic; 550, Symbolic Logic; 712, Advanced Logic; 745, Philosophy of Language.

Psychology: 511, Introduction to Perception, Language, and Thought; 712, Psychology of Language; 812, Psycholinguistics.

Spanish: 601, Spanish Phonetics; 791, Methods of Foreign Language Teaching; 795, History of the Spanish Language.

Theater and Communication: 572, Language and Behavior; 630, Psychology of Communication; 673, Experimental and Descriptive Studies in Oral Communication; 783, Theories of Language.

Other courses may be substituted, with the permission of students' advisers and the Linguistics Committee, when they are pertinent to the needs of the students' programs.

Microbiology

Microbiology explores the fundamental nature of living organisms that cannot be seen by the unaided eye. The primary emphasis is on bacteria and viruses. Such learning is especially valuable to students planning to enter city, state, or federal government service, or positions with universities, research institutes, or industrial organizations. Some students go on for graduate work. The principal areas of concentration in the department are: 1) general; 2) medical; 3) public health; 4) environmental; 5) marine and soil microbiology; 6) microbial cytology and ultrastructure; and 7) virology.

A minimum of 28 semester credits from department offerings must be completed in addition to a course in biochemistry (Bchm 601 or 656). Chem 403-404 should be taken in the freshman year, and Organic Chemistry (Chem 545 or 651-652) is

also required. Within the Department of Microbiology, the following core courses are required: General Microbiology (503), and Taxonomy and Ecology (701). For students desiring a strong background in medical microbiology, Pathogenic Microbiology (702), Immunology and Serology (705), and Virology (706) are recommended. For students wishing to emphasize natural processes, the following courses are recommended: Marine Microbiology (707), Microbial Biogeochemistry (708), and Soil Microbiology (712). Environmental Microbiology (600), Microbial Genetics (704), and Microbial Cytology (709-710) are recommended as courses valuable to microbiology majors. The Problems in Microbiology course (795-796) is available for students by special permission. For students considering graduate school and the microbiology registry exam, courses in mathematics through calculus, physics, quantitative analysis, and introductory courses in botany and zoology are strongly recommended. The courses for each major program are selected to meet the needs of the individual, as determined by the student and the adviser.

Students interested in majoring in microbiology are advised to consult Professor Galen E. Jones.

Music

The Department of Music offers two degree programs: the Bachelor of Arts and the Bachelor of Music. The Bachelor of Music degree is discussed on page 33.

The Bachelor of Arts program offers students an opportunity to major in music within the liberal arts curriculum. This program is intended for those who wish to pursue the serious study of music and to acquire at the same time a broad general education; it is recommended for those considering graduate study leading to the M.A. or Ph.D. degrees, or the five-year undergraduate-graduate program in teacher education.

To be admitted formally to the B.A. program, students must give evidence of satisfactory musical training by taking an admission audition. Students must declare music as a major before the beginning of the junior year, but it is highly recommended that they declare as early as possible, considering the large number of required courses. Admission to the upper level of the degree program will be subject to review by the Department of Music faculty.

The Bachelor of Arts degree is offered with four options: music history, performance study, music theory, and preteaching. All students must complete a minimum of 32 credits of coursework in music, of which the following are required: Musi 471-472, 473-474, 571-572, 573-574, and 501-502. In addition, the requirements for each option are given below.

Music History Option advanced theory (4 credits); advanced history and literature (12 credits); any one of 541-550 inclusive (8 credits). Students must also demonstrate the ability to sight-read a Bach chorale harmonization.

Performance Study Option advanced theory or literature (4 credits); performance study (16 credits—two credits per semester). Qualified students may major in voice, piano, strings, woodwinds, brass, or percussion. Voice majors must successfully complete, in addition to the foreign language requirement, one of the following course sequences: Ital 401-402, Germ 401-402, Fren 401-402.

Music Theory Option advanced theory (12 credits); advanced history (4 credits); any one of 541-550 inclusive (8 credits). Students must also demonstrate the ability to sight-read a Bach chorale harmonization. The emphasis in this option is on musical composition and/or theory.

Preteaching Option MuEd 500; Musi 751-752; Musi 779; techniques and methods (8 credits); 8 credits from Musi 441-453 inclusive; 8 credits from any one of Musi 541-550; piano proficiency. (See page 21, Preparing for Teaching.)

A public performance is given during the senior year—for music history majors this must be a lecture or lecture-recital; for performance majors, a full recital; for theory majors, a lecture, lecture-recital, or a recital including at least one original composition; for preteaching majors, a half recital is the minimum. A more detailed description is available from the Department of Music.

All students minoring in music must complete a minimum of 20 credits of coursework in music, of which the following are required: Musi 471-472, Musi 473-474, Musi 501-502.

The Department of Music is a member of the National Association of Schools of Music. Prospective B.A. majors in music are advised to consult with Associate Professor Paul Verrette.

Philosophy

Philosophy has always been the heart of a liberal education, deepening and enriching the lives of those who pursue it. It is also excellent preparation for a variety of vocational and professional endeavors.

The Philosophy Major The following courses constitute a core required of all majors: 570, 575, 640; 530; and one from 610, 615, 620. Students conscious of a more-than-ordinary interest in philosophy should take these core courses as early as possible.

Beyond the core, majors must select, with their advisers' approval, three additional philosophy courses (exclusive of 699 and 795-796) at or above the 500 level, at least two of which must be at the 700 level, for a minimum of eight courses.

Special-Interest Program Students may add to the above major a special-interest program of value in planning for postgraduate education or entry into such areas as law, medicine, business, education, theology, or social work. Special advisers are prepared to provide informal counsel to philosophy majors interested in these areas.

Graduate Preparatory Emphasis This emphasis is strongly recommended for students who plan to do graduate work in philosophy. Beyond the five core courses, such students should select, with their advisers' approval, six additional philosophy courses above the 400 level, for a total of eleven courses. At least three of these six should be on the 600-700 level (exclusive of 699 and 795-796) and one of them should be 550.

30

Departmental Commendation Students accepted for departmental commendation will register for 699 (usually during the second semester of the senior year) and will write, under the guidance of an adviser, an original paper in philosophy. If completed successfully, students will receive a letter of commendation.

Students interested in an honors program in philosophy must first meet the eligibility standards set by the College of Liberal Arts and should then contact the department chairperson for information.

Philosophy Minor Any five philosophy courses constitute a minor.

Five-Year, Dual-Degree Program in Philosophy and Business Administration The dual-degree program permits students to earn both a B.A. in philosophy and an M.B.A. in five years instead of the normal six. All requirements for both the philosophy major and the M.B.A. program offered by the Whittemore School of Business and Economics will be met. A maximum of 16 credits may be counted toward both degrees. Students interested in this program should consult the departmental adviser to the program early in their sophomore year.

Political Science

The study of politics, to which the courses and seminars of the Department of Political Science are devoted, includes the development of knowledge of political behavior by individuals and groups as well as knowledge about governments: their nature and functions, their problems and behavior, and their interactions—at the national and international levels and at the local, state, and regional levels.

Much of the learning offered by the Department of Political Science can also be regarded as essential for good citizenship, since political knowledge helps to explain both the formal institutions by which societies are governed and the issues that encourage people toward political interest and political action. In addition, such learning is especially valuable to students planning to enter local or national government or other public service, including the foreign service, and will be of great help to those who intend to study law and enter the legal profession. For teaching, particularly at the college level, and for many types of government service, graduate work may be indispensable, and an undergraduate major in political science will provide the most helpful foundation for further study in the field. Such an emphasis will also be valuable for students seeking careers in journalism, international organizations, and the public affairs and administrative aspects of labor, financial, and business organizations.

The major program in political science consists of at least nine courses (36 credits) and not more than 12 courses (48 credits), to be distributed in the following way:

1. Two from the offerings at the 400 level. These courses are designed for the introductory level and should be completed by majors by the end of the sophomore year.
2. Six from the offerings at the 500 and 600 levels. Of these, at least one shall be chosen from each of the four fields in which the department's courses are organized: American politics, comparative politics, international politics, and political thought.
3. One from the offerings at the 700 level.

In addition to the courses regularly offered, the department will have available selected topics, independent study, and internships. Interested students should check with the department office to learn of the offerings for a given semester.

The department also offers several internship opportunities giving students experience in various aspects of government, policymaking, and the legal system at the local, state, and national levels. Students need not be political science majors, but a student must have taken certain course prerequisites for each kind of internship. In addition, students must have junior or senior standing and normally have a 3.0 average or higher to be eligible for consideration. Washington placements are made either through the Department of Political Science or through the Washington Center for Learning Alternatives; major credit must be arranged through the department.

Psychology

A general function of the Department of Psychology is to provide an academic major that will contribute to the broad education of undergraduates. Specifically, students will be exposed to the scientific study of behavior and will achieve an increased understanding of the behavior of humans and animals.

Students majoring in psychology are required to complete 32 credits distributed as follows: 1) Psyc 401; 2) Psyc 601; 3) two courses, selected from among the following options: Psyc 602, 621, 702 through 732; 4) two courses from among the following options: Psyc 651, 652, 671, 755 through 781; 5) two additional courses from among the 500-level, 600-level, and 700-level departmental offerings. Specific course selections should be discussed with advisers. Exceptions to the prescribed major requirements must be petitioned through the department.

Psychology majors planning to go on to graduate work in psychology should include Psyc 602 or 704 among their courses.

The minor in psychology consists of five courses (20 credits), including Psyc 401 and at least two courses at the 500-level or above. No more than 4 credits of independent study may be applied toward the minor requirements.

See the department's undergraduate secretary for further details on both the major and the minor in psychology.

Five-Year, Dual-degree program in Psychology and Business Administration The dual-degree program permits students to earn both a B.A. in psychology and an M.B.A. in five years instead of the normal six. All requirements for both the psychology major and the M.B.A. program offered by the Whittemore School of Business and Economics will be met. A maximum of 16 credits may be counted toward both degrees. Students interested in this program should consult with the departmental adviser to the program early in their sophomore year.

Undergraduate Awards for Majors Each spring the faculty choose two psychology undergraduates as the recipients of the following awards: the Herbert A.

Carroll Award for an outstanding senior in psychology, and the George M. Haslerud Award for an outstanding junior in psychology.

Russian

The Russian major is offered through the Russian section of the Department of Ancient and Modern Languages and Literatures. It provides students with an opportunity to study one of the world's most important languages, its culture and its literature. In addition to the intrinsic value of Russian as a liberal arts experience, the Russian major leads to a number of careers, such as teaching, translation and interpretation, government and foreign service. It is also a valuable asset in preparing for careers in law, business, economics, international trade, and it can serve as a dual major with business administration, the natural and physical sciences, and with other liberal arts fields such as English, history, political science, sociology, philosophy, theater and communications, linguistics, other foreign languages.

Students are invited to seek advice from the department regarding career options and possibilities. The Russian section organizes for credit an annual two-week study tour to the Soviet Union in January or May. Through national academic organizations, it makes summer and semester study opportunities in the Soviet Union available to qualified students.

The major in Russian consists of a minimum of 36 credits numbered 503 and above. Specific course requirements are: Russ 503-504, Russ 521, Russ 631-632, Hist 763 or 764, Polt 544 or 555 or 564, plus an additional eight credits from among offerings in Russian.

The minor in Russian consists of a minimum of 20 credits above Russ 402 and must include Russ 503-504, and Russ 631-632.

Social Service

The social work major prepares graduates for social work practice within the context of a liberal arts education. It also prepares students for admission to graduate schools of social work and other graduate professional programs in human service professions.

Social work majors pursue a program that deals with the origin, development, and organization of health and welfare institutions; methods of social work practice; and the relationship of the social work professions to contemporary social issues and problems. Social work majors gain direct experience and a better understanding of the field in required participation in a social welfare setting for a minimum of 300 hours. The details of the field experience will be arranged between the student and the designated faculty.

Social work majors are required to take SS 522, 523, 550, 551, 622, 623, and 631; Soc 601; and one course from each of two designated areas, a listing of which will be provided by the faculty advisers. Students wishing to major in social work should consult with the chairperson, Professor Pauline Soukaris, in Murkland Hall.

Sociology

The major in sociology is designed to provide a degree of concentration in the study of society consonant with a broad liberal education. However, those who wish to teach sociology in secondary schools are advised to consult with the chairperson of the Department of Education for additional courses in related subjects and teaching that may be required. Those who wish to pursue a career in social service should consult with the chairperson of that department about additional courses or possibilities for graduate training. Those who wish to enter graduate programs in sociology should consult with their advisers about additional courses, particularly in the areas of theory, satistics, and methodology, that they should take.

Majors must complete a minimum of 36 semester credits with grades of C– (1.67) or higher and a grade-point average of 2.00 or better in sociology courses (including Anth 625). Soc 400 (or 500 or 600), 599, 601, 602, and 611 are required. At least two of the additional major courses must be at the 600 or 700 level (not including 795 or 796). The department recommends that majors select one of three options:

1. General sociology, involving the five core requirements plus additional courses in sociological theory and methods. This option is particularly recommended for students who plan to do graduate study in sociology.
2. Social psychology, involving the five core requirements plus additional courses in social psychology.
3. Applied sociology, involving the five core requirements plus additional courses for students interested in applying sociology to such fields as criminal justice, mental health and illness, race relations, the family, and sociological impact assessment.

Students interested in majoring in sociology should consult with the chairperson of the Departmental Committee for Undergraduate Studies for guidance in selecting an option. It is the responsibility of all sociology majors to obtain the latest information from the department office.

Departmental Honors Honors in sociology will be awarded to students who achieve, in addition to the regular requirements of the major, at least a 3.67 grade-point average in courses counted toward the major and satisfactorily complete a four-credit senior thesis under the guidance of a faculty member. A 3.50 overall grade-point average is also required. Students wishing to work for honors should inform the undergraduate committee of their intention during the second semester of their junior year, appending their academic record and a statement of the area in which they intend to write their thesis.

Spanish

The major in Spanish, offered through the Spanish section of the Department of Ancient and Modern Languages and Literatures, is for those students who wish to acquaint themselves more thoroughly with the language, culture, and literature of the Spanish-speaking peoples.

In addition, through the major, students can prepare for practical goals: teaching Spanish in grade or high schools, or teaching other subjects in bilingual programs. With advanced degrees, teaching at the college level and engaging in scholarly research or entering such fields as linguistics or library science are career opportunities. Majors gifted in languages may consider the fields of translation and interpretation. With coursework in business, sociology, psychology, speech, etc., Spanish majors may prepare for work in Spanish-speaking areas of the world as well as in bilingual regions of the United States and also with many governmental agencies.

The Spanish section sponsors a Junior Year Abroad program which is open to majors and nonmajors. Contact the Spanish section for further details.

The major consists of a minimum of 34 credits in courses numbered 504 and above. Specific course requirements are 1) language and culture: 525 or 526, 601, 631-632; 2) introductory literature: students must take a total of three courses; either the sequence 651-652 or the sequence 653-654, plus one semester from the sequence not chosen; 3) advanced literature: two courses at the 700 level.

Interested students should talk to the coordinator or undergraduate adviser for Spanish.

Theater

Theater as a composite art, reflecting life, is closely related to painting, sculpture, music, dance, literature, and philosophy. One of the two majors offered in the Department of Theater and Communication, the theater major stresses a broad background in the arts within their social framework. Students interested in the creative aspects of speech communication will find an opportunity for personal and preprofessional growth in theater and its drama, with opportunity for independent study of basic theories and personal involvement in active laboratory situations.

The required curriculum for theater majors consists of: ThCo 402, 435, and a minimum of eight hours from each of the three areas (theory/history, design/technical, performance) plus one full course or its equivalent from Performance Project and/or Scenic Arts Project. In addition, Senior Seminar and Senior Project (697; 698) are required, plus an additional eight hours (distributed or in one area) at the 600-700 level. The courses applicable to each category are available from the students' advisers.

There are three other course sequences available within the theater major: 1) courses leading to a major that when combined with requirements from the Department of Education qualify students for secondary school certification; 2) courses leading to a major that when combined with the requirements of the Department of Education prepare students for elementary certification with an undergraduate specialization in youth drama; 3) courses leading to a theater major with a concentration in dance. (In order to be eligible to take either of the first two sequences, students must qualify for the five-year certification program in the Department of Education.)

All students interested in majoring in theater should consult with the chairperson of the Department of Theater and Communication. Students wishing to transfer to the University of New Hampshire and major in theater must first have the approval of the department.

Zoology

The zoology major is designed to prepare students for admission to graduate work, which ordinarily is required for engaging in professional work in pure or applied zoology. Other students may elect the major, however.

The University's location on tidewater and near the open ocean provides an unusual opportunity for study of marine zoology and marine ecology.

Zoology majors must complete 32 credits of biology (botany, biology, entomology except 400, microbiology except 501 and 502, and zoology) courses with a 2.00 average and at least a C− (1.67) in each course. Minimum requirements for the zoology major are as follows: Chem 403-404; organic chemistry; calculus (Math 425) or statistics; college physics: Zool 412; Bot 411 or 412; Biol 541; at this point, students may select the vertebrate track and choose Zool 518, 527, 604, and 629, plus an elective, or they may select the invertebrate track and complete Zool 528, 537, 604, and 628, plus an elective. A suggested sequence of courses follows:

Freshman: Zool 412, Bot 411 or 412, Chem 403-404, and Math 425 (or INER 528).

Sophomore: Zool 518 and 527 or Zool 528 and 537, Biol 541, Chem 545.

Junior: Zool 604, Phys 403 (and INER 701 if taken in addition to or instead of Math 425).

Senior: Zool 629 or 628, another biological sciences course in zoology or other biological sciences department (may be taken earlier than the senior year).

Students who are interested in a zoology major should consult the supervisor, Assistant Professor Edward N. Francq.

Bachelor of Fine Arts Curriculum

The Bachelor of Fine Arts curriculum provides training for students who plan to enter professional graduate school or pursue careers as professional artists. The basic unit of nine courses consists of drawing (Arts 432, 532), beginning oil painting (Arts 542), sculpture (Arts 567), sophomore seminar (Arts 598), and four courses in art history. This unit is designed to provide a common body of concepts and techniques and is intended to raise the level of creative achievement for all students in the B.F.A. degree curriculum.

During the junior and senior years, students will concentrate on six courses, two of which must be at the 600 level, in one of the major program areas of the department. The major programs are: 1) painting; 2) sculpture; 3) individualized programs. Individualized programs may be designed in the following subject areas: A) ceramics; B) drawing; C) weaving; D) graphics; E) metalsmithing; F) photography; and G) wood furniture design. Proposals for individualized programs are accepted only by permission of the department chairperson, the major adviser, and the Departmental Bachelor of Fine Arts Faculty Committee. Advanced students will also be required to take four art electives. Finally, each senior will be required to take Arts 798, Seminar/Senior Thesis, which culminates in the mounting of an exhibition of the student's work. (Printed copies of suggested sequences of courses may be obtained from the Department of the Arts. Also, see the following listing.)

The four courses in art history required in this program are used to satisfy partially the University's Group III General Education Requirement.

Candidates applying for the Bachelor of Fine Arts program are required to submit a portfolio.

Suggested Sequences of Courses B.F.A.—Painting

Freshman Year	Fall	Spring
Arts 432, Drawing I	4	—
Arts 483, Art of the Modern World	4	—
Non-Art Academic	8	8
Arts 532, Drawing II	—	4
Arts 542, Oil Painting I, or Arts 544, Water Media I	—	4
Sophomore Year		
Arts 567, Sculpture I	4	—
Arts 533, Drawing III	4	—
Art History Elective	4	—
Non-Art Academic	4	4
Arts 547, Oil Painting II	—	4
Arts 598, Sophomore Seminar	—	4
Art History Elective (500 or above)	—	4
Junior Year		
Arts 548, Oil Painting III or Arts 645, Water Media II	4	—
Art Elective	4	—
Non-Art Academic	8	4
Arts 643, Oil Painting IV	—	4
Arts 796, Independent Study —Painting	—	8
Senior Year		
Arts 798 Senior Seminar/Thesis	8	—
Arts 644, Oil Painting V	4	—
Non-Art Academic	4	8
Art Elective	—	4
Art History Elective (500 or above)	—	4

B.F.A.—Sculpture

Freshman Year		
Arts 432, Drawing I	4	—
Arts 483, Art of the Modern World	4	—
Non-Art Academic	8	8
Arts 532, Drawing II	—	4
Arts 567, Sculpture I	—	4
Sophomore Year		
Arts 668, Sculpture II	4	—
Art History Elective	4	—
Arts 542, Oil Painting I, or Arts 544, Water Media I	4	—
Non-Art Academic	4	8
Arts 669, Sculpture III	—	4
Arts 598, Sophomore Seminar	—	4
Junior Year		
Arts 768, Sculpture IV	4	—
Art History Elective	4	—
Non-Art Academic	4	4
Arts 796, Independent Study —Sculpture	—	8
Arts 767, Casting	—	4
Senior Year		
Arts 798, Senior Seminar/Thesis	8	—
Art Elective	4	4
Non-Art Academic	4	8
Art History Elective (500 or above)	—	4

Bachelor of Music Curriculum

The Bachelor of Music degree program is offered to students who wish to develop their talent in performance, composition, or music education to a high professional level. The program is recommended to those considering graduate study leading to the Master of Music or Doctor of Musical Arts degrees. Prospective majors are advised to consult with Associate Professor Paul Verrette.

To be admitted to the B.M. program, students must demonstrate a high degree of musical competence or significant creative ability during an audition or examination. Selectivity is exercised as appropriate to the professional requirements of each programmatic option. Students must formally declare the B.M. as a degree program before the beginning of the sophomore year. Continuation into the upper level of the program is subject to review by the faculty of the Department of Music.

A public performance is required during the senior year. (For performance majors this must be a full recital; for theory majors, a lecture, lecture-recital, or a recital including at least one original composition; for music education majors, a half recital is a minimum.) A more detailed description is available from the Department of Music.

The Bachelor of Music curriculum offers concentration in the following areas: option 1, piano; option 2, organ; option 3, voice; option 4, strings, woodwinds, brass, or percussion; option 5, theory (composition); option 6, music education.

Requirements for the degree include: 128 semester credits; a minimum 2.00 grade-point average in all courses completed at the University of New Hampshire; selected General Education Requirements as listed in the following options; and specific curriculum requirements as indicated. Courses are generally to be completed in their arranged sequence.

Students in music education must maintain a minimum 2.50 grade-point average in the major and have a 2.20 cumulative average at the time of application for student teaching (February 15 of junior year).

Bachelor of Science Curriculum in Biology

Freshman Year

All Options: Engl 401, Freshman English; General Education Requirements—selected science (2 courses), selected social science; Musi 471-472, 473-474.

Option 1. Musi 542 (8 credits).

Option 2. Musi 544 (8 credits).

Option 3. Musi 541 (8 credits); Musi 542 (2 credits); Music Laboratory—Choral (2 credits).

Option 4. Performance Study—major instrument (8 credits); Musi 542 (2 credits); Music Lab—instrumental (2 credits).

Option 5. Musi 542 (2 credits); Performance Study—brass (1 credit); Performance Study—woodwind (1 credit), or Techniques and Methods.

Option 6. Performance Study—major instrument (2 credits); Music Laboratory (2 credits);Techniques and Methods (4 credits); MuEd 500; Educ 500.

Sophomore Year

All Options: General Education Requirements—selected social science (2 courses), selected humanities (nonmusic) (2 courses); Musi 571-572, 573-574.

Option 1. Musi 542 (8 credits).

Option 2. Musi 544 (8 credits).

Option 3. Musi 541 (8 credits); Musi 542 (2 credits); Music Laboratory—choral (2 credits).

Option 4. Performance Study—major instrument (8 credits); Musi 524 (2 credits); Music Lab—instrumental, (2 credits).

Option 5. Musi 542 (2 credits); Musi 501-502; Performance Study—strings (1 credit), or Techniques and Methods.

Option 6. Performance Study—major instrument (2 credits); Musi 501-502; Music Laboratory (2 credits); Techniques and Methods (4 credits).

Junior Year

Options 1-5: General Education Requirements—Foreign language recommended (2 courses).

Option 1. Musi 542 (8 credits); Musi 501-502; Musi 771-772; Musi 455.

Option 2. Musi 544 (8 credits); Musi 501-502; Musi 771-772; MuEd 540 and 741.

Option 3. Musi 541 (8 credits); Musi 542 (2 credits); Musi 501-502; a second foreign language—German, French, or Italian (8 credits); Music Laboratory—choral and/or opera workshop (4 credits).

Option 4. Performance Study—major instrument (8 credits); Musi 501-502; Musi 751-752; Ensemble (2 credits); Music Laboratory—instrumental (2 credits).

Option 5. Musi 771-772; Musi 775-776; Musi 779; Musi 781; Musi 542 (2 credits).

Option 6. Musi 751-752; Musi 779; Performance Study—major instrument (2 credits); Music Laboratory (2 credits); Educ 700; Educ 701; and one social science.

Senior Year

Option 1. Musi 542 (8 credits); Musi 455; Musi 735; two 4-credit courses elected in advanced theory and literature; two 4-credit courses elected outside the Department of Music.

Option 2. Musi 544 (8 credits); two 4-credit courses in liturgical music, organ literature, repertoire and hymnology; two 4-credit courses in music literature and/or advanced theory; two 4-credit courses elected outside the Department of Music.

Option 3. Musi 541 (8 credits); Musi 542 (2 credits); two 4-credit courses in music literature and/or advanced theory; Music Laboratory—choral, ensemble, and/or opera workshop (4 credits).

Option 4. Performance Study—major instrument, (8 credits); two 4-credit courses in music literature and/or advanced theory; two 4-credit courses elected outside the Department of Music; Music Laboratory—instrumental (2 credits); ensemble (2 credits).

Option 5. Musi 773; Musi 777 (6 credits); Musi 542 (2 credits); two 4-credit courses in music literature; two 4-credit courses elected outside the Department of Music.

Option 6. MuEd 787-788; MuEd 791-792; Educ 705; Educ 694; Performance Study—major instrument (2 credits); Music Laboratory (1 credit); General Education Requirement (two courses, foreign language recommended).

All students are responsible for adding electives as needed to total a minimum of 128 credits for graduation.

The Bachelor of Science curriculum in biology is an interdepartmental program that permits students considerable specialization while providing them with a broad cultural education.

Degree Requirements

1. At least 128 credits with a minimum cumulative grade-point average of 2.00 in all courses completed at the University of New Hampshire.

2. Completion of the University General Education Requirements, including Engl 401.

Major Requirements

Specific curriculum requirements are presented in detail on page 73.

College of Life Sciences and Agriculture

35

Kurt C. Feltner, Dean
Avery E. Rich, Associate Dean
Emery P. Booska, Assistant to the Dean

Departments and Institute

Animal Sciences
Biochemistry
Botany and Plant Pathology
Entomology
Home Economics
Plant Science
Institute of Natural and Environmental Resources

Degrees, Majors, and Specializations

Bachelor of Arts

Botany and Plant Pathology
Entomology

Bachelor of Science

Animal Sciences
- Animal Science
- Preveterinary Medicine

Biochemistry
Biology
Botany and Plant Pathology
Entomology
General Studies
Home Economics
- Child-Family Studies
- Consumer Studies
- Home Economics Education
- Human Nutrition and Dietetics

Occupational Education
Plant Science

(within the Institute of Natural and Environmental Resources)
Community Development
Environmental Conservation
Hydrology
Resource Economics
Soil Science
Wildlife Management

Bachelor of Science in Forestry

(within the Institute of Natural and Environmental Resources)
Forest Resources
- Forest Management
- Forest Science
- Quantitative Science
- Wood Science

36

Purposes and Programs

The objectives of the College of Life Sciences and Agriculture are to give students a fundamental education in the biological, physical, and social sciences and to introduce them to the arts and humanities. In addition, specific technical courses are provided in students' interests and majors.

The College offers three undergraduate degrees: the Bachelor of Arts, the Bachelor of Science, and the Bachelor of Science in Forestry.

Advisory System

A member of the faculty whose area of interest is closely related to the student's is appointed as an adviser to assist the undergraduate in planning his or her academic program.

Undeclared Major

Students may select a major upon entering the college or may wait until registration for the sophomore year. Students who are uncertain about choosing a specific major may remain undeclared during their freshman year. In most cases they should take the following courses, after which they should be ready to declare a major:

Fall	Spring
Chem 403	Chem 404
Bot 411 or Zool 412	Bot 412 or Zool 412
Psyc 401*	Engl 401
AnSc 401, PlSc 421, or FoRs 423 and 425	REco 411*

*or other elective course to meet a Group II requirement.

Undeclared freshmen should explore possible majors by taking courses in the areas or programs that interest them most. They should talk to faculty, students, and their adviser, Dean Rich, concerning requirements, job opportunities, etc., in the various programs and should be prepared to declare a major by April when they preregister for the fall semester of the sophomore year.

Honors Program

The College of Life Sciences and Agriculture, through its various departments, offers superior students the opportunity to participate in an honors program that is individually designed to provide added intellectual incentives and opportunities. Participation in the honors program is by invitation of a faculty member with the approval of the department concerned and the dean of the college. It is limited to those students entering the sophomore or junior year with at least a 3.00 grade-point average. The recommending faculty member, his or her department chairperson, and the dean will constitute the student's academic advisory committee. This committee and the student will decide upon a suitable academic program. Departmental and college course requirements may be waived for students in the program, who must, however, complete the same number of credits to graduate as other students in the department.

Combined Programs of Study

In addition to pursuing a single major, students may combine programs of study as follows:

Minors: See page 16 for requirements. See also Interdisciplinary Minors, page 45.
Second Majors: See page 16.
Dual-Degree Programs: See page 15 for requirements.
Student-Designed Majors: See page 72.

Other combined and interdisciplinary opportunities are described in "Special University Programs," pages 71–75.

Bachelor of Arts

Students majoring in botany and plant pathology or in entomology may elect to earn either a Bachelor of Arts degree or a Bachelor of Science degree. The degree requirements in the College of Life Sciences and Agriculture for the Bachelor of Arts are almost the same as for a Bachelor of Science plus the addition of a foreign language requirement (see page 15 for B.A. degree requirements).

Bachelor of Science

Many professional careers are open for graduates of the College. There are opportunities in resource development and conservation, as well as in agricultural industries. In all departments, students may prepare for further graduate work in their respective fields of interest.

The agricultural industries, food processors, and banks employ graduates as price analysts and managers.

State planning and recreation agencies, soil conservation services, the cooperative extension services, and private research firms employ rural and urban planners, hydrologists, conservation experts, resource development economists, nursery planners, and landscape gardeners.

The Peace Corps and the Foreign Agriculture Service hire farm production experts, soil and water managers, market analysts, agricultural engineers, teachers, plant and animal breeders, and nutrition specialists.

The federal government and state agencies, universities, health services, and private foundations employ biochemists, geneticists, animal nutrition specialists, plant and animal pathologists and physiologists, veterinarians, foresters, home economists, and entomologists.

Academic Requirements For the Bachelor of Science degree, a total of 128 credits* is required. In addition, students must complete the General Education Requirements found on page 13, obtain a written recommendation for graduation from their adviser and department chairperson, and achieve a 2.00 cumulative grade-point average for all courses taken at the University of New Hampshire.

Some of the courses prescribed in the following degree programs partially fulfill the General Education Requirements. Students should see their adviser for specific information.

Five-Year Program: B.S.-M.B.A.

The College of Life Sciences and Agriculture and the Whittemore School of Business and Economics offer a combined five-year program leading to a B.S. in Plant Science and an M.B.A. degree. Information about the program can be obtained from the plant science department or from the undergraudate counselor in the Whittemore School.

Bachelor of Science in Forestry

Students majoring in forest resources earn a professional degree designated as a Bachelor of Science in Forestry. See page 40 for information.

*The wildlife management major requires 132 credits.

Major Programs

Animal Sciences

The animal sciences courses provide students with fundamental scientific training in such specialized areas as genetics, physiology, nutrition, animal hygiene, processing, pathology, and management. Students also have an opportunity to concentrate studies further in the fields of animal, dairy, or poultry science; light horses; preveterinary medicine; or animal biology. The two options are animal sciences and preveterinary medicine.

Outstanding graduates are qualified to pursue advanced study in preparation for college teaching, research, and responsible technical positions in industry and federal and state agencies. Students interested in the production aspects of the animal sciences industry may seek jobs as production managers or positions in the feed or equipment industries, marketing organizations, animal breeding associations, sales and service work in allied industries, and other areas of the diversified animal industry.

The department maintains Morgan and Thoroughbred horses for all phases of classwork, including riding. Herds of Hereford and Angus cattle, Yorkshire swine, and a flock of Dorset sheep are maintained in a new livestock facility.

The nationally recognized dairy herd, consisting of registered Ayshire, Guernsey, Holstein, and Jersey animals, is housed in a new dairy barn. The Ritzman Animal Nutrition Laboratory includes bomb calorimeters, metabolism stalls for digestion studies, respiration chambers for heat production measurements, and other facilities used in nutrition teaching and research with farm and lab animals.

New poultry farm facilities are for instruction and research and include laboratories for teaching and research in poultry genetics, nutrition, diseases, and management.

Laboratory facilities in Kendall Hall, including such modern equipment as ultracentrifuge, amino acid analyzer, gas chromatograph, and electron microscope, provide the latest scientific training in animal hygiene. Kendall Hall is an entirely new facility, with five floors devoted to offices, classrooms, and laboratories for the Department of Animal Sciences.

The department works closely with the New Hampshire animal industry, and frequent class trips are made to leading farms, industrial concerns, processing plants, etc., where opportunities are available for viewing industry in action.

Undergraduates who contemplate veterinary medicine as a career should confer early with the adviser to preveterinary medicine students. It should be noted that all veterinary colleges give first preference for admission to applicants from their respective states. Out-of-state students who are admitted must show above-average scholastic ability. It is desirable that applicants to colleges of veterinary medicine have some farm experience; in fact, it is a prerequisite for admission to some.

The following courses are required of students in the animal sciences option: AnSc 401, 501, 502 and 506, Chem 401-402 or 403-404, Bchm 501, Bot 411 (412) or PlSc 421, Zool 412, Zool 504 or Zool 604, and Math 420 (or 425 or INER 528). In addition, several animal sciences courses should be selected, depending on the student's particular interests. Students interested primarily in basic science should follow a program similar to the requirements listed below for the preveterinary option.

Preveterinary students take most of the courses listed for the animal sciences option plus special courses that prepare them for veterinary school, including: AnSc 701, Bchm 656 (or 601 or 751-752), Chem 651-652, Micr 503, Phys 403-404, ThCo 403, Zool 507-508.

Biochemistry

Biochemistry is the study of chemistry of living things and of life processes. The program in biochemistry provides a fundamental education in chemistry and the biological sciences and includes basic courses in physics and mathematics.

Two curricula are offered to meet the educational requirements of students with differing professional goals.

Biochemistry Curriculum A provides intensive preparation in chemistry and biochemistry and basic courses in botany, zoology, microbiology, and genetics. This curriculum is recommended for students preparing for graduate study or for admission into professional schools of medicine, dentistry, or pharmacy. Students entering the curriculum should register for Chem 405-406, Math 425-426, Bot 411, and Zool 412 in the freshman year.

Biochemistry Curriculum B provides a fundamental education in chemistry and the biological sciences with enrichment in biochemical specialties including medical, analytical, marine, and nutritional biochemistry. It provides a strong educational background for technical employment in research and service programs of universities, medical schools, hospitals, research institutes, and industrial or government laboratories. Students entering this curriculum should register for Chem 403-404, Bchm 402, Bot 411, and Zool 412 in the freshman year.

Students interested in a biochemistry major are advised to consult with the department chairperson as early as possible to assure the most effective curricular planning.

Biology

The interdepartmental biology major is described in the chapter on Special University Programs.

Botany and Plant Pathology

The botany and plant pathology program explores the fundamental nature of plants. Botany graduates with suitable undergraduate backgrounds may enter the field of secondary education or become research technicians. Those students who have an interest in university teaching and/or research, governmental research, and certain kinds of industrial positions should expect to complete graduate education in the field.

The principal areas of concentration in the department are: 1) plant physiology, 2) cell biology, 3) ecology, 4) phycology, 5) freshwater biology, 6) biological oceanog-

38

raphy, 7) plant pathology, 8) systematic botany, 9) plant anatomy and morphology, 10)mycology, and 11) morphogenesis.

Two botany and plant pathology degrees are offered: Bachelor of Science and Bachelor of Arts. All undergraduate botany majors are required to take the following core of botany courses: 411, General Botany, or 412, Introductory Botany (or equivalent); 503, The Plant World; 566, Systematic Botany; 606, Plant Physiology; and 658, Plant Anatomy, or 762, Morphology of the Vascular Plants. Also required are two botany electives, Zool 412, and one year of chemistry. These courses cannot be used to fulfill Group I requirements. Majors must maintain a grade of C− (1.67) or better with a grade-point average of 2.00 in required courses. Beyond that, the program of each individual is selected by the student and adviser to meet particular needs.

Students interested in majoring in botany and plant pathology are invited to consult with A. Linn Bogle, Chairman.

Entomology

The Department of Entomology offers courses for students who wish to specialize in the study of insects and noninsect terrestrial arthropods, insect pest management, and insects in relation to people. There are employment opportunities for graduates in federal and state agencies, public institutions, and commercial and industrial firms in the areas of crop protection, forestry, conservation, and public health.

Students receive a fundamental education in the major fields of entomology, including general biology of insects and other arthropod groups, forest entomology, economic entomology, medical entomology, insect morphology, physiology, taxonomy, and insect pest management. Those who wish to specialize in chemical control of insects are expected to take courses in mathematics and chemistry. Outstanding students are encouraged to pursue graduate study.

Entomology majors are expected to complete 32 semester credits successfully in courses offered by the department. Courses in other departments may be taken in lieu of the above with the consent of the major adviser. Majors are required to take the following courses: Ento 402, 503; Bot 411 or 412; Zool 412; Chem 403-404; and 545(6) or Bchm 501, plus four courses from the following: Bot 566, 606, 751, 754; INER 528; Micr 501 (and 502) or 503; PlSc 421, 607, 651, 652, 653, 654; Zool 528, 721.

Students may earn either a Bachelor of Science or Bachelor of Arts degree in entomology.

Those contemplating a career in entomology are advised to consult with the chairperson of the Department of Entomology.

General Studies

General studies is a flexible, loosely structured curriculum for students with a broad, general interest in several areas of life sciences and agriculture. It cuts across departmental lines and in some respects resembles a self-designed major. It is not intended to be a catch-all for students from other colleges but is designed to serve the needs of Life Sciences and Agriculture students. Students majoring in general studies should take Chem 403-404, Zool 412, and Bot 411, 412, or PlSc 421. Six additional courses in the college (or closely related courses approved by the adviser), two of which must be at the 600 level or above, are required. These courses should be interrelated in such a way that they will help students meet their goals for employment or further study.

Freshmen who are unsure of a major should not declare general studies as a major but should remain undeclared for a semester or two. See page 36.

Home Economics

The objectives of the program in home economics are to provide a broad general education in the social and natural sciences, the humanities, and the arts and to provide specialized instruction based on these disciplines as preparation for professional careers in which the interests and well-being of the individual, the consumer, and the family are paramount.

The department provides professional preparation for men and women through four options: 1) child-family studies; 2) consumer studies; 3) home economics education; and 4) human nutrition and dietetics.

The department has been approved by the New Hampshire State Board of Education for the preparation of nursery-kindergarten and secondary school teachers in vocational home economics and family-life programs. Requirements for some professional programs make it advisable for students to specify an option as soon as possible, and by the sophomore year at the latest.

Candidates for the degree of Bachelor of Science must complete 32 courses or a minimum of 128 credits with an average of C (2.00) or better; a grade of C− (1.67) or better is required in all other courses taken to meet departmental requirements. Professional or specialized education requirements include a minimum of nine courses or 36 credits in home economics. Undergraduates are required to take a minimum of four credits from each of the three major subject matter areas (food-nutrition, child-family, and consumer studies) offered by the department. Upon selection of a program option, students, in consultation with their advisers, will select the remaining six courses (24 credits) from among those offered in the department that relate to their particular fields of interest. Specialized education requirements also include three courses or 12 credits in one of the related social sciences or natural sciences numbered 500 or above, and four courses or 16 credits for professional preparation (to be selected in consultation with the adviser). These final four courses may help students meet certification standards for secondary school teaching, preschool teaching, ADA requirements for a dietetic internship, or other objectives. Students seeking nursery-kindergarten teacher certification must apply through the Department of Home Economics for acceptance into student teaching by spring semester of the junior year. Students seeking secondary home economics certification must apply

through the Department of Education. See page 22 for information.

Students wishing to major in the Department of Home Economics are advised to consult with the department chairperson as early as possible. Further information about specific programs may be obtained by contacting the department.

Institute of Natural and Environmental Resources

The Institute of Natural and Environmental Resources (INER) is a multidisciplinary unit with approximately 25 faculty and 650 students in seven undergraduate and six graduate programs. The organization of the institute, without conventional departments, provides an environment for faculty and students to learn about the relationships between people and natural resources. The seven undergraduate programs are: Community Development, Environmental Conservation, Forest Resources, Hydrology, Resource Economics, Soil Science, and Wildlife Management.

Community Development

The Community Development Program deals with broad aspects of community problem resolution, including economic, social, political, and technical matters. Communities are viewed as systems subject to meaningful analysis and emphasis is placed on the community development process of helping people learn how to work together, organize their efforts, and analyze community problems in a democratic, decision-making framework. The curriculum takes an interdisciplinary approach, and includes field experience as a vital component, along with classroom and independent study.

The core courses in the curriculum provide students with the basic community development tools. Flexibility is added through electives that permit students to specialize and develop strong minors in areas such as conservation, planning, education, administration, pollution and waste disposal, natural resource management, or resource economics. Opportunities are available for directed field experience.

While this program is suitable for preparing citizens for more effective leadership in their community, employment opportunities are available in the United States, Canada, and in emerging nations. Many federal and local agencies are now undertaking revenue-sharing and community assistance programs and need personnel who are trained to apply the arts and sciences to the problems of communities. Similarly, many private and local groups are concerned with community planning and development.

Students interested in a community development major or minor may consult with the program coordinator, Associate Professor Edmund F. Jansen, Jr., James Hall, or with the director of the institute.

Required Courses

INER 401*	Natural and Human Resources of New England
REco 507	Introduction to Community Development
REco 508	Applied Community Development
REco 795 or 796	Independent investigation in field analysis of a specific problem in a community in the region

At least five of the following:

Admn 712	Organizational Change
Admn 713	Interpersonal and Group Dynamics
Biol 541	General Ecology
INER 528	Applied Statistics I
INER 702	Natural Resources Policy
INER 709	Soils and Community Planning
Reco 614	Community Planning
REco 705	Planned Change in Nonmetropolitan Communities
REco 717	Law of Community Planning
Soc 500	Social Psychology
Soc 560	Rural-Urban Sociology
Soc 745	Social Stratification

Courses to Satisfy General Education Requirements

Biological and Physical Sciences and Mathematics:

Bot 411 or Bot 412	General Botany or Introductory Botany
Math 420	Fundamental Mathematics

Two additional courses selected by student

Arts, Humanities, and Social Sciences:

REco 411	Introduction to Resource Economics
REco 506	Population, Food, and Resource Use In Developing Countries
or	
REco 606	Land Economics and Use
Soc 400	Introductory Sociology

Two additional courses selected by student

Outside major department

Engl 401	Freshman English
Engl 501	Introduction to Prose Writing
ThCo 403	Public Speaking

Three additional courses selected by student

General Electives

At least seven courses (28 semester hours) selected by student

*required for freshmen only

Environmental Conservation

The program in environmental conservation gives a broad background for understanding environmental and resource problems and their solutions. Economic activity within our biological ecosystems requires understanding of both subject-matter areas, and development of policies and planning is essential to resolving environmental problems.

Students must develop a concentration related to career goals. The concentration consists of eight courses selected with the assistance of the faculty adviser from the offerings of the University. Concentrations center on a variety of conservation-related areas, such as land-use planning, ecological education, pollution control, writing about natural resources, etc. In addition, students must complete the 12 courses listed below, which make up the core of the environmental conservation program.

A minor of five courses in environmental conservation is available for students majoring in other areas. Permission is required.

The following 12 courses are required of all majors:

INER 401*	Natural and Human Resources of New England
Bot 411 or Bot 412	General Botany Introductory Botany
Zool 412	Principles of Zoology
Ecology electives	Two of the following: Biol 541, General Ecology; Bot 741, Ecosystem Analysis; Bot 742, Physiological Ecology; FoRs 527, Silvics; FoRs 634, Wildlife Ecology; FoRs 672, Ecological Energetics
REco 411	Introduction to Resource Economics
REco	An advanced course in the economics of resources
INER 635	Contemporary Conservation Issues
INER 702	Natural Resources Policy

40

Hydr 504	Freshwater Resources
INER 637	Practicum in Environmental Conservation: 4 credits. This practicum will be an independent project involving field work on an actual conservation activity during the senior year. A written report will be required. The project may be developed with any faculty member in the Institute of Natural and Environmental Resources.
Speaking or writing course	A speaking skills course or a writing skills course (beyond Freshman English)

*Required of freshmen only.

Students should plan to work for a master's degree if they wish to be professional conservationists. The undergraduate degree offers an education in environmental conservation with the opportunity for specialization or generalization in related fields.

All students must complete the University General Education Requirements.

Students interested in a major may consult with the program coordinator, Associate Professor John Carroll, James Hall, or with the director of the institute.

Forest Resources

The Forest Resources Program, which is accredited by the Society of American Foresters, has the objective of combining a basic education with technical forestry education to meet the needs of professional foresters.

Professional foresters are employed in a variety of forest-land management and wood utilization positions. Some graduates work with natural resource protection and the improvement of environmental quality. Others are employed in the production and utilization of raw materials; still others become involved with wildlife, watershed, and recreation management. There are rapidly expanding opportunities in urban forestry.

Managerial and administrative skills are required of most professional foresters. This program provides a foundation in biological knowledge and managerial skills, with elective freedom to cultivate special abilities and interests. The curriculum leads some students into graduate studies, for which they have been prepared in the undergraduate program.

Students majoring in forest resources complete 137 credit-hours for the degree of Bachelor of Science in Forestry. The University's General Education Requirements are met by taking the required courses listed in the accompanying chart and by choosing electives from the following: four courses in the arts, humanities, and social sciences; and four courses other than those listed under forest resources.

In addition to the normal University fees and tuition, forest resources students are required to pay certain course transportation fees and the cost of meals in connection with some planned field sessions.

All of the following freshman and sophomore courses, or their equivalents, must be completed before entry into any of the junior and senior forestry courses: Dendrology, Identification of Trees and Shrubs, Freshman English, General Botany, Calculus I, Wood Science and Technology, Principles of Economics, Writing (or Speaking), Silvics, Soils and the Environment, Computer Methods, Applied Statistics, Forest Economics, and Forestland Measurement and Mapping. Junior and senior forestry program courses include: Silviculture, Forest Fire Protection, Forest Mensuration, Forest Resources and Measurement Mapping, Forest Management, Forest Resource Management Seminar, and Wood Products Manufacture and Marketing.

In addition to these formal courses, all forestry majors are required to have at least one summer of forestry work experience (FoRs 500). Students are responsible for their own summer work, though assistance is available from the faculty.

Before the junior year, students must choose a single area of concentration from the following options, and must earn 24 credits within that concentration.

Forest Management Option One course at the 500 level or above in accounting, management, or administration in the Whittemore School; FoRs 753, Operations Control and Analysis; and four additional courses (16 credits) in advanced forestry, wildlife, hydrology, soils, resource management, urban forestry, or administration.

Forest Science Option Chem 404, General Chemistry; Bchm 501, Biological Chemistry, or Bchm 601, General Biochemistry; Zool/PlSc 604, Principles of Genetics; and PlSc 606, Plant Physiology; and two courses in advanced plant science, botany, or entomology.

Wood Science Option Chem 404, General Chemistry; Math 426, Calculus II; two courses in FoRs 695-696 (Section C), Investigations in Wood Products; and two courses in advanced mathematics, science, or engineering.

Quantitative Science Option Math 426, Calculus II; Math 527, Differential Equations with Linear Algebra, or Math 528, Multidimensional Calculus; Math 645, Applied Linear Algebra; a course in probability or statistics; and two courses in advanced mathematics, statistics, or computer science.

Freshman Year		Fall	Spring
INER 401*	Natural and Human Resources of New England	2	—
FoRs 423	Dendrology	2	—
FoRs 425	Identification of Trees and Shrubs	2	—
FoRs 426	Wood Science and Technology	—	4
Engl 401	Freshman English	4	—
Bot 411 or 412	General Botany or Introduction to Botany	4	(4)
Math 425	Calculus I	4	—
Econ 401 or REco 411	Principles of Economics or Introduction to Resource Economics	(4)	4
Advanced English	Writing or Speaking Development	—	4
Elective		—	4
		18	16
Sophomore Year			
Science Elective	Chem. 403, ESci 401, or Phys 401	4	—
Ento 507 or Bot 753**	Forest Entomology or Forest Pathology	—	4
FoRs 527	Silvics	4	—
INER 528	Applied Statistics 1	—	4
Soil 501	Soils and the Environment	4	—
FoRs 544	Forest Economics	—	4
Computational	C S 403 or INER 511	2	—
FoRs 542	Forestland Measurement and Mapping	—	2
Elective		4	4
		18	18

Junior Year			
FoRs 629	Silviculture	3	—
FoRs 644	Forest Mensuration	—	4
FoRs 652	Forest Resources Measurement and Mapping	—	2
FoRs 660	Forest Fire Protection	—	2
Electives		14	10
		17	18
Senior Year			
FoRs 500***	Summer Work Experience	0	—
FoRs 745, 798	Forest Management, Forest Resources Management Seminar	4	4
FoRs 754	Wood Products Manufacture and Marketing	—	4
Electives		12	8
		16	16

* Suggested for freshmen only.
** Bot 753 requires junior standing.
*** Open to all classes, may be repeated.

Students interested in the forest resources program may consult with the program coordinator, Associate Professor Richard Weyrick, James Hall, or with the institute director.

Hydrology

Hydrology is the science underlying development and control of water resources on and beneath the earth's surface. Because water is a basic requirement of life, it has social, economic, and political significance throughout the world. As the population of the world grows and as industrial, recreational, agricultural, and residential needs for water increase, greater emphasis will be placed on the study and understanding of problems associated with water resources.

Core courses expected of majors are:

INER 401	Natural and Human Resources of New England
Chem 403-404	General Chemistry
Phys 407-408 or Phys 403-404	General Physics I and II or Introductory Physics for Biologists
Bot 411 or 412 or PlSc 421	General or Introductory Botany or Concepts of plant growth
C S 410	Introduction to Computer Programming
Math 425, 426	Calculus I and II
ESci 401	Principles of Geology I
Soil 501	Soils and the Environment
ESci 561	Geomorphology
Math 527 or INER 528	Differential Equations with Linear Algebra or Applied Statistics I or equivalent
INER 757	Basics of Remote Sensing
Hydr 603	Hydrology and Water Management
Hydr 705	Principles of Hydrology
Hydr 710	Groundwater Hydrology

Students interested in the hydrology program may consult with the program coordinator, Professor Gordon Byers, Pettee Hall, or with the institute director.

Resource Economics

This program offers training in resource economics, including public resource policy, resource management, conservation economics, and regional economics. Training is also available in agricultural economics, including farm management, food marketing, agricultural policy, and world food supplies.

Students in resource economics receive training primarily in the science of economics and its use in problem solving by individuals, households, business firms, communities, and administrators of governmental agencies. In addition, students must satisfy General Education Requirements, which lead to a broad university education. Majors interested in the economic or business aspects of agriculture will be expected to take courses in the animal sciences and plant science departments.

Students majoring in the social sciences and life sciences and agriculture departments of the University may find it to their advantage to elect courses or a minor in resource economics. By doing so, their basic training can be supplemented in a specific area of interest, such as farm management and agricultural marketing for agricultural majors, or resource development and natural-resource policy for social science majors.

Required Courses

All of the following:

Engl 401	Freshman English
Soc 400 or Polt 401	Introductory Sociology Politics, Morality, and Community
ThCo 403	Public Speaking
Admn 502 or 517	Financial Accounting, or Survey of Basic Accounting
Bot 411	General Botany*
Zool 412	Principles of Zoology*
Soil 501 or Hydr 504	Soils and the Environment* Freshwater Resources*
INER 401**	Natural and Human Resources of New England
REco 411	Introduction to Resource Economics
Math 420 or 425	Fundamental Mathematics or Calculus I
Econ 605	Intermediate Microeconomic Analysis
Econ 611	Intermediate Macroeconomic Analysis
INER 528 or INER 701	Applied Statistics I Statistical Methods I

At least six of the following, of which two must be 700 level:

REco 501	Agricultural and Natural Resource Product Marketing
REco 504	Management of Farm and Related Resource-Based Business
REco 506	Population, Food, and Resource Use in Developing Countries
REco 507	Introduction to Community and Community Development
REco 606	Land Economics and Use
REco 611	Marine Resource Economics
REco 676	Economics of Water Use and Quality Management
REco 706	Economics of Resource Development
REco 710	Resource Economics Seminar
REco 756	Regional Economic Analysis
REco 795-796	Investigations in Resource Economics
INER 615	Linear Programming Methods

* or equivalent to satisfy General Education Requirements
** Required for freshmen only

Students who major in resource economics are qualified for a wide variety of opportunities upon graduation. Private business, public institutions, and government agencies currently have a strong demand for specialists trained in agricultural, fisheries, and forestry marketing; conservation resource development, community development, and land-use policy; extension work; resident teaching; and farm management. In many cases, students may wish to improve their qualifications by pursuing more specialized graduate studies in one or more of the above areas.

42

Students interested in a major or minor in resource economics may consult with the program coordinator, Professor Richard Andrews, James Hall, or with the institute director.

Soil Science

Soil science is the study of the nature and properties of soils, as well as of their importance to modern society. It includes the study of the chemical and physical properties of soils, their formation, classification, conservation, and management. Soils are evaluated as a resource in urban and rural community planning, as well as for food and fiber production.

Graduates of the soil science program are academically qualified for many positions in the public and private sections of our economy. For example, the increasing urbanization of the Northeast is creating a demand for professional soil scientists who are competent to assess the capability of soils to support development. In addition, the associated demand for fiber is expanding the role of soils scientists capable of working with foresters in planning for more intensive utilization of our forest resources.

Required courses

INER 401	Natural and Human Resources of New England
ESci 401	Principles of Geology I
Bot 412	Introductory Botany
Bot 606	Plant Physiology
Chem 403-404	General Chemistry
Chem 406, 407	Quantitative Analysis
Soil 501	Soils and the Environment
Soil 602, 702	Chemistry of Soils
Soil 704	Soil Classification and Mapping

at least eight of the following (or equivalents):

Phys 407-408	General Physics I and II
Math 425-426	Calculus I and II
C S 410	Introduction to Computer Programming
ESci 762	Glacial Geology
Micr 712	Soil Microbiology
CiE 665	Soil Mechanics
INER 528	Applied Statistics
INER 711	Statistical Methods II
INER 757-758	Remote Sensing
Soil 502	Soil-Plant Relationships
Soil 605	Mineral Cycling
Soil 614	Soil Management
Soil 795-796	Independent Studies

Students interested in the soil science major should consult with Associate Professor Nobel Peterson or with the institute director.

Wildlife Management

The wildlife management curriculum is for students whose interest is in the understanding, production, management, and utilization of game and other forms of wildlife. The curriculum provides a knowledge of wildlife species and of the total forest and field environment of which they are a part. It also prepares students for possible employment with public and private agencies in wildlife management and ecology, and is a base for graduate study, which is needed for research and teaching.

The degree earned is a Bachelor of Science with a major in wildlife management. The program, administered in the Institute of Natural and Environmental Resources, is operated in cooperation with the animal sciences and zoology departments.

Field work is carried out during the academic year on wildlife areas near the campus. Each June, a two-week session is held for all students who have completed the sophomore year. There is no additional summer camp. In addition to the normal University fees and tuition, students are required to pay transportation and meal charges in connection with regularly planned field sessions. Majors are encouraged to obtain summer employment related to their career objective.

Students majoring in wildlife management are required to complete 132 credits for the bachelor's degree. In completing the curriculum, listed below, students will meet the University General Education Requirements. These requirements should be met by choosing electives as follows: six courses in the arts, humanities, or social sciences; and four courses from the other General Education Requirements. Two electives should be chosen from additional resource-oriented courses.

Freshman Year		Fall	Spring
INER 401*	Natural and Human Resources of New England	2	—
Bot 411	General Botany	4	—
Engl 401	Freshman English	4	—
FoRs 423	Dendrology	2	—
FoRs 425	Identification of Trees and Shrubs	2	—
Math 420 or	Fundamental Mathematics or	—	4
Math 425	Calculus I		
Zool 412	Principles of Zoology	—	4
REco 411	Introduction to Resource Economics	—	4
Electives		4	4
		18	16
Sophomore Year			
AnSc 501	Animal Anatomy and Physiology	4	—
INER 635	Contemporary Conservation Issues	4	—
Chem 403-404	General Chemistry	4	4
INER 528	Applied Statistics I	—	4
Zool 542	Ornithology	—	4
Electives		4	4
		16	16
Spring Field Session (June)			
FoRs 542	Forestland Measurement and Mapping	2	—
Junior Year			
Bchm 501	Biological Chemistry	4	—
Zool 712	Mammalogy	4	—
Biol 541	General Ecology	4	—
FoRs 634	Wildlife Ecology	—	4
AnSc 614	Diseases and Parasites of Wildlife	—	4
Polt 401	Politics, Morality, and Community		
or 402	American Politics and Culture	—	4
C S 403 or	Introduction to Digital Computer Programming	2	—
INER 511	Computation Methods in Natural Resources		
Electives		4	4
		18	16
Senior Year			
FoRs 737, 738	Game Management I and II	4	4
Zool 711	Natural History of Cold-blooded Vertebrates	4	—
Zool 772	Fisheries Biology	—	4
Electives		8	8
		16	16

*Required of freshmen only.

Students interested in the wildlife management major may consult with the program coordinator, Professor William Mautz, Pettee Hall, or with the institute director.

Occupational Education

The occupational education curriculum provides professional preparation for teachers of vocational-technical education and County Cooperative Extension personnel. Flexibility is maintained among individual programs with up to 30 credits being allowed for qualified students under the occupational competency testing and evaluation program.

Career choices are varied, with graduates teaching in nearly all areas of vocational-technical education positions through participation in field experiences, in addition to coursework.

Students desiring to major or minor in occupational education should consult with the program chairperson, Professor W. H. Annis.

Plant Science

Students interested in plants and their use for food, feed, fiber, recreation, or ornamental purposes may major or minor in plant science. A core curriculum of physical and biological sciences is required. Students may then select courses that relate these sciences to their specific interests. Two curriculum options, the science option and the general option, are offered to plant science majors. The following courses or their equivalents are required for these options:

		Science Option	General Option
PlSc 421	Concepts of Plant Growth	x	x
PlSc 522	Environment and Plant Response	x	x
PlSc or Zool 604	Principles of Genetics	x	x
PlSc 606	Plant Physiology	x	x
PlSc 566 655, 652 653, 654 or 678	Elective in Crop Production		x
PlSc 672	Plant Propagation	x	x
PlSc 795 or 796	Elective in Special Topics	x	
Math 425-426	Calculus I and II	x	
Phys 403-404	Introduction to Physics for Biologists	x	
Chem 403-404, 545-546	General and Organic Chemistry	x	x
Micr 503	General Microbiology	x	
Ento 402	Introductory Entomology	x	x
Soil 502	Soils and the Environment	x	x
Bot 402	Introductory Botany	x	x
Bot 751 or 753	Plant Pathology or Forest Pathology	x	x
INER 528, 701 or Inco 650	Statistics	x	

Because of the diversity of employment possibilities, the general option curriculum is flexible. Students will find opportunities in management of farms, greenhouses, golf courses, or nurseries; teaching; journalism; park or highway planning commissions; sales or brokerage aspects of wholesale and retail marketing; and food and feed processing firms. Students should pursue the science option to prepare for graduate study and careers in research or teaching. Minor programs in administration, economics, English (journalism), recreation and parks, or occupational education can be tailored to accommodate specialized interests and complement fundamental requirements.

Students interested in a plant science major or minor may consult with the department chairperson, Professor Owen M. Rogers.

A 5-year dual degree program leading to a B.S. degree in plant science and an M.B.A. degree (business administration) is available. Superior students preparing for a business career in agricultural enterprises should notify the department of their interest in their sophomore year. They will be considered for Graduate School enrollment in their junior year.

44

College of Engineering and Physical Sciences

Richard S. Davis, Dean
Donald W. Melvin, Associate Dean
Donald A. Moore, Assistant to the Dean

Departments

Chemical Engineering
Chemistry
Civil Engineering
Earth Sciences
Electrical and Computer Engineering
Mathematics and Computer Science
Mechanical Engineering
Physics

Programs of Study

Bachelor of Science

Chemical Engineering*
  Energy
  Environmental Engineering
Chemistry*
Civil Engineering*
  Environmental Engineering
  Constructed Systems
Computer Science*
Electrical Engineering*
  Computer Engineering
  Electrical Engineering Systems
  Electrical Engineering Science
Geology*
Mathematics*
Mathematics Education*
  Elementary
  Secondary
Mathematics (Interdisciplinary)
  Mathematics—Chemistry
  Mathematics—Computer Science
  Mathematics—Economics
  Mathematics—Electrical Science
  Mathematics—Fluid Dynamics
  Mathematics—Mechanics
  Mathematics—Thermodynamics
  Mathematics—Physics
Mechanical Engineering*
  Energy
Physics*

Bachelor of Arts

Chemistry
Chemistry and Physics Teaching
Earth Science Teaching
Geology
Mathematics
Physics
Science

Bachelor of Engineering Technology

Electrical Engineering Technology
Mechanical Engineering Technology

*Designated degree (the name of the specialization is included on the diploma, e.g., B.S. in Chemistry)

Purposes and Programs

The College of Engineering and Physical Sciences seeks to provide an optimal opportunity for students to achieve educational objectives appropriate to their interests in engineering, mathematics, and the physical sciences. The college offers a vigorous professional education in each of its nine primary disciplines leading to the Bachelor of Science, and a broad liberal education coupled with majors in mathematics and each of the three physical sciences leading to the Bachelor of Arts. All programs include an opportunity for study in the arts, humanities, and social sciences.

The key to an undergraduate program in the college is flexibility, with a strong emphasis on personal and individualized education. In addition to specific programs, a number of suboptions are available. Special programs can be developed to meet the specific interests of individual students.

Math 425 and 426 or the equivalent in transfer credits or advanced placement approved by the Department of Mathematics and Computer Science are required by all departments of the college for their majors.

Bachelor of Science

The programs leading to the Bachelor of Science degree, offered in each of the departments of the college, emphasize the preparation of students for a professional career and continuing or graduate education.

The degree requirements for the Bachelor of Science include the University General Education Requirements (page 13) and the specific departmental requirements for graduation. A minimum grade-point average of 2.00 must be achieved. Graduation credit requirements established by the departments range from 128 to 138. There are enrollment limitations in some programs, and it is not possible to guarantee all change of major requests.

Bachelor of Arts

Programs leading to a Bachelor of Arts degree are offered in the departments of chemistry, earth sciences, mathematics, and physics. These programs provide a broad liberal education along with a major in one of these fields. Students interested in science, but undecided about the field, may enter the college as a science major. However, the student should indicate what area of concentration he or she wishes to follow; e.g., chemistry, earth sciences, mathematics, physics. The University requirements for the Bachelor of Arts degree are on page 15.

Bachelor of Engineering Technology

The Engineering Technology program emphasizes applied engineering in two curricula, electrical and mechanical technology. The program enables the student with an appropriate associate degree from an accredited technical institute to obtain a B.E.T. degree in electrical or mechanical engineering technology in two years at UNH. This program emphasizes design and applications and uses the latest techniques and equipment. Student projects and liaisons with New Hampshire industries further enrich the program.

Five-Year Program: B.S.-M.B.A.

The College of Engineering and Physical Sciences and the Whittemore School of Business and Economics offer a joint program leading to a Bachelor of Science (B.S.) in chemical engineering, civil engineering, electrical engineering, or mechanical engineering and a Master of Business Administration (M.B.A.) in five years rather than the normal six. In order to receive both degrees in five years, students in the program may have to take more than 16 credits per semester in several semesters (though no more than five courses or 20 credits). Provision has been made to count 12-24 credits towards both undergraduate and graduate degree requirements. All other University and departmental requirements for each degree must otherwise be met.

The program first "pre-admits" qualified students to take one M.B.A. course in each semester of their junior year. The pre-admission process should be completed by April 1 of the sophomore year. The program is carried out jointly by representatives from the Whittemore School and the College of Engineering and Physical Sciences. Juniors enrolled in the program should submit a formal application to the Graduate School (in the second semester of the junior year) in order to be admitted to the M.B.A. program by March 1; they will be judged by academic standards with special emphasis on maturity and experience.

Most of the fourth year is occupied by core M.B.A. courses, while the fifth year is used for M.B.A. electives (some of which might be taken in the undergraduate major department) and for completing all requirements for the undergraduate degree. The M.B.A. will be granted only if the bachelor's degree requirements are successfully completed.

The details of each student's curriculum are worked out jointly with the departmental undergraduate B.S. adviser and with an adviser for the M.B.A. program.

Undergraduate advisers: S.S.T. Fan, chemical engineering; D.J. O'Brien, civil engineering; K. C. Stotz, electrical and computer engineering; R. Corell, mechanical engineering. M.B.A. advisers: F. Kaen, L. Paddock, B. Coakley, Whittemore School.

Interdisciplinary Minors

Interdisciplinary minors have been developed in ocean engineering, oceanography, biomedical systems and instrumentation, environmental engineering, and materials science. These programs will enable students to obtain experience in the specialized area and to retain identification with their major professional area. (For University requirements, see page 16.)

Ocean Engineering The ocean engineering minor recognizes undergraduate engineering students who acquire a nucleus of knowledge about engineering pertaining to the ocean and the coastal zone.

Students must satisfactorily complete five courses from the following list: ESci 501, Introduction to Oceanography; ESci 752, Chemical Oceanography; ESci 758, Introduction to Physical Oceanography; ESci 759, Geological Oceanography; E E 781, Ocean Instrumentation; E E 785, Underwater Acoustics; M E 737, Ocean Mechanics I; M E 738, Ocean Mechanics II; M E 751, Naval Architecture in Ocean Engineering; M E 752, Submersible Vehicle Systems Design; M E 757, Coastal Engineering and Processes; Tech 610, Introduction to Ocean Engineering; and Tech 697, Ocean Projects. Ordinarily, students must take ESci 501, Tech 697, and three

additional courses from the above list, two of which must be engineering courses.

Students wishing to take the ocean engineering minor should indicate their interest to their department chairperson no later than the beginning of the junior year. They will be assigned to their departmental ocean minor adviser, who will assist in planning courses.

Materials Science Minor The minor is open to all students of the University. It offers a broad introduction to materials science. The minor is administered by the Department of Mechanical Engineering. Students should contact the minor supervisor by mid-semester of their junior year.

The students must complete five courses as follows. Required courses ME 561 with ME 561L or CiE 622 with Lab. Two courses from the group ME 760, ME 766, and Chem 545. Additional courses from the group ME 760, 761, 763, 766, ESci 512, 613, Chem 517, 518, 545, Phys 618.

Interested students may consult Professor Frederick G. Hochgraf, Department of Mechanical Engineering.

Biomedical Systems and Instrumentation The biomedical systems and instrumentation minor encompasses the application of engineering science and technology to the fields of medicine and biology. Biomedical engineers participate in the development of medical instrumentation, physiological sensors, prosthetic devices, orthopedic and surgical devices, biomaterials, patient safety, and in the applications of computers to medical problems. Biomedical engineers may continue their studies at the graduate level and find employment in biomedical research, as practically-oriented clinical engineers in hospitals or other clinical settings, or with the medical device and instrument industry.

Engineering students electing this minor must select E E 783, Biomedical Engineering, and either E E 784, Biomedical Instrumentation, or, for students who lack a background in electronics, an appropriate special independent study course approved by both the student's adviser and the chairperson of the Biomedical Systems and Instrumentation Minor Committee. Additionally, three other courses must be selected, in consultation with the student's adviser, from the list below. Since many of these courses have prerequisites, students should begin the program during their sophomore year. During the final semester, application should be made to the dean to have the biomedical systems and instrumentation minor shown on transcripts.

Engineering Electives: E E 714, Minicomputer Applications Engineering, with an appropriate choice of topic and project; E E 796, Special Topics in Electrical Engineering; 695 (E E, M E, CiE, ChE), Engineering Projects and Independent Study (with prior approval of minor chairperson); E E 757, Fundamentals of Communications; E E 782, Control Systems; M E 703, Heat Transfer; M E 707, Analytical Fluid Dynamics; M E 726, Experimental Mechanics; M E 727, Advanced Mechanics of Solids; ChE 601, Fluid Mechanics and Unit Operations; ChE 602, Heat Transfer and Unit Operations; ChE 605, Mass Transfer and Stagewise Operations; ChE 752, Process Dynamics and Control; ChE 696, Independent Study.

Science Electives: Zool 507-508, Human Anatomy and Physiology (or Zool 518, 527); Chem 651-652, Organic Chemistry (prerequisite: Chem 404 or 405); Bchm 656, Physiological Chemistry and Nutrition; PhEd 606, Neurology; PhEd 620, Physiology of Exercise; PhEd 652, Kinesiology.

Students interested in a career in biomedical systems and instrumentation should consult early in their curriculum with the minor committee chairperson, Dr. Glen C. Gerhard.

Oceanography The minor in oceanography, available to all students in the University, consists of 20 semester hours with grades of C (2.00) or better and no pass/fail courses. No more than eight major requirement credits may be used. Students may not elect minors in both ocean engineering and oceanography. All courses in the program shall be selected by students in consultation with the oceanography minor adviser, Professor T. C. Loder in the Department of Earth Sciences.

Required courses include: 1) ESci 501, Introduction to Oceanography; 2) two of the following courses: ESci 752, Chemical Oceanography; ESci 758, Introduction to Physical Oceanography; ESci 759, Geological Oceanography; 3) any two of the following courses, or a suitable substitute approved by the minor adviser (it is advisable that at least one of the courses be in the biological sciences): Bot 525, 722, 723; engineering: Tech 610, ChE 695, CiE 695; E E 695, M E 695, 737, 751, 757; Micr 707, 708; Zool 674, 715, 724, 772.

Students are encouraged to declare their intention to enter the program before the end of the junior year. During the final term, students should apply to the dean to have the minor shown on the transcript.

Environmental Engineering Minor The environmental engineering minor provides a comprehensive introduction to major areas of interest in environmental protection, namely air pollution and water pollution, through the three required courses. Further breadth in environmental engineering or depth in specific areas can be attained through the proper choice of elective courses.

The requirements for the minor include a total of at least 20 credits from the following: 1) three required courses: ChE 609, Fundamentals of Air Pollution and Its Control; CiE 643, Introduction to Environmental Pollution Control; ChE 772, Physiochemical Processes for Water and Air Quality Control, or CiE 644, Water and Wastewater Engineering; 2) a minimum of two elective courses from the following list: ChE 605, Mass Transfer and Stagewise Operations; ChE 772, Physiochemical Processes for Water and Air Quality Control; CiE 644, Water and Wastewater Engineering; CiE 743, Environmental Sampling and Analysis; CiE 746, Wastewater Treatment Plant Design; CiE 748, Solid Waste Disposal; CiE 749, Chemistry of Natural Waters; E E 745, Fundamentals of Accoustics; E E 762, Illumination; M E 503, Thermodynamics I; Micr 501, Public Health Microbiology; 695, Engineering Projects (ChE, CiE, E E, M E).

Choice of elective courses should be made in consultation with the minor area adviser, J. A. Olofsson, CiE, or S. S. T. Fan, ChE. Students normally start this program in the junior year and should declare

Departmental Programs of Study

their intention to enter the program as early as possible during the sophomore year. During the final term, students should apply to the dean to have the minor shown on the transcript.

Other Programs

Independent Study and Projects All departments within the college offer courses in independent study or in projects, the content varying with the current scientific and technological needs and with student and faculty interest.

Permission of the instructor and/or the department chairperson is required. (See the course descriptions for the independent study and project courses and for specific requirements.) The initiative for independent study courses in any area rests with the student.

Special Provisions "The requirement of a given course in any prescribed curriculum may be waived by the faculty of a student's college. The student's petition must be approved by his/her major adviser and the dean of the college. This power will usually be delegated by the faculty to the dean or to a committee." (Senate Rule 05.21(s): Waiver of Requirements in a Prescribed Curriculum)

This rule offers students the opportunity to develop a somewhat individualized plan of study with intellectual incentives and opportunities in addition to those in a regular curriculum.

In addition, upon the recommendation of the department chairperson, superior students may be allowed to count credits from up to two 800-level courses toward both a bachelor's degree and a master's degree, provided that the students have been admitted to the master's program.

Research Opportunities The talents and expertise of the faculty in all departments are reflected in the number of ongoing research projects. Undergraduates are included in many of these research projects, with the intent of discovering and fostering their creative talents. In funded research projects, students may have an opportunity to receive pay while learning.

Some flavor of the multiplicity of the research programs is reflected in special facilities, a few of which are: Analog Computer Facility, Antenna Systems Laboratory, Bioelectronics Laboratory, Center for Industrial and Institutional Development (CIID), Computation Science Center, Electronics Laboratory, Engineering Design and Analysis Laboratory, Fluid Mechanics Laboratory, Materials Laboratories, Mechanics Research Laboratory, Sanitary Engineering Laboratory, Solid State Laboratory, Space Science Center, Wind Tunnel and Water Tunnel Facility, and X-Ray Laboratory.

Students have the opportunity to acquire applied experience in business and industry through the Center for Industrial and Institutional Development (CIID), which undertakes client-sponsored professional projects in management and technical areas for business and industry, and for state and local governments.

Preparing for Teaching Students interested in mathematics education (elementary or secondary), chemistry and physics teaching, or earth science teaching should refer to the Preparing for Teaching section that begins on page 21 and to the appropriate department description of the requirements.

Combined Programs of Study In addition to pursuing a single major, students may combine programs of study as follows:
Minors: See page 16 for requirements. See also Interdisciplinary Minors, pages 45 and 22, and Departmental Programs of Study in this section.
Second Majors: See page 16 for requirements.
Interdisciplinary Majors: Many of the departments in the college offer ways of combining a major with another field of interest. See the descriptions that follow.
Dual-Degree Programs: See page 15 for requirements.
Student-Designed Majors: See page 72 for requirements.

Other combined and interdisciplinary opportunities are described in "Special University Programs," pages 71–75.

In addition to the following departmental majors and options, these departmental minors are offered:

Chemical engineering
Chemistry
Computer science
Civil engineering
Electrical engineering
Engineering technology
Geology
Mathematics
Physics

Chemical Engineering

Chemical engineering is concerned with the analysis and design of processes that deal with the transfer and transformation of energy and material.

The practice of chemical engineering includes the conception, development, design, and application of physicochemical processes and their products; the economic development, design, construction, operation, control, and management of plants for these processes; and activities relating to public service, education, and research.

Traditional employment areas in the chemical process industries include industrial chemicals, petroleum and petrochemicals, plastics, pharmaceuticals, metals, textiles, and food. Chemical engineers are also working in increasing numbers in the emerging areas of energy engineering, pollution abatement, and biochemical and biomedical engineering; in addition, they are employed by many of the government laboratories and agencies as well as private industries and institutions.

The curriculum is designed to provide training for students to enter the diverse areas of employment or graduate study. The considerable number of electives in the curriculum provides flexibility for individuals to design programs that fulfill individual needs and interests. They also provide an opportunity for students to elect departmental options or interdisciplinary minors in their programs.

A minimum of 131 credits is required for graduation with the degree of Bachelor of Science in Chemical Engineering. There are 11 electives in the chemical engineering curriculum in addition to the technical elective. Six of these are for the arts,

humanities, and social science requirements, and one must be chosen from the biological sciences. Among the remaining four electives, two must be chosen from chemical engineering courses.

Freshman Year		Fall	Spring
Engl 401	Freshman English	4	—
Math 425-426	Calculus I and II	4	4
Phys 407-408	General Physics I and II	4	4
Chem 405	Introductory Chemistry	4	—
ChE 410	Survey of Current Energy and Pollution Issues	—	4
Elective		—	4
		16	16
Sophomore Year			
Chem 683-684	Physical Chemistry I and II	3	3
Chem 685-686	Physical Chemistry Laboratory	2	2
Math 527	Differential Equations with Linear Algebra	4	—
C S 403	Introduction to Digital Computer Programming	2	—
ChE 501-502	Introduction to Chemical Engineering I and II	3	3
Electives (3)		4	8
		18	16
Junior Year			
Chem 545	Organic Chemistry	3	—
Chem 546	Organic Chemistry Laboratory	2	—
ChE 601	Fluid Mechanics and Unit Operations	3	—
ChE 602	Heat Transfer and Unit Operations	—	3
ChE 603	Applied Mathematics for Chemical Engineers	4	—
ChE 604	Chemical Engineering Thermodynamics	—	4
ChE 612	Chemical Engineering Laboratory I	—	2
Electives (2)		4	4
Tech. Elective		—	4
		16	17
Senior Year			
ChE 605	Mass Transfer and Stagewise Operations	3	—
ChE 606	Chemical Engineering Kinetics	3	—
ChE 608	Chemical Engineering Design	—	4
ChE 613	Chemical Engineering Laboratory II	2	—
Electives (5)		8	12
		16	16

Energy Option This option covers the major areas of current interest in the energy field. The required courses provide students with a general background knowledge of fossil fuels, nuclear power, solar energy, and other alternative energy resources. The elective courses will permit the student to study topics of special interest in more depth or gain a broader perspective on energy and some closely related subjects. Three courses are required and a minimum of two additional courses of at least three credits each should be selected from the electives list. Students interested in the energy option should declare their intention during the sophomore year to the department faculty. They may consult with Professor S. S. T. Fan.

Required Courses		
ChE 705	Natural and Synthetic Fossil Fuels	4
ChE 712	Introduction to Nuclear Engineering	4
M E 710	Solar Heating Systems	3
		11
Elective Courses		
ChE 695	Chemical Engineering Project	3-4
ChE 696	Independent Study	3-4
ChE 772	Physicochemical Processes for Air and Water Quality Control	4
M E 504	Thermodynamics II	4
		6-8

Environmental Engineering Option The chemical engineering program, with its substantial requirement in chemistry, fluid dynamics, heat transfer, mass transfer, unit operations, and reaction kinetics, provides students with a unique preparation to deal with many aspects of environmental pollution problems. The option gives students a special focus on the application of chemical engineering principles and processes to the solution of problems relating to air pollution, water pollution, and the disposal of solid waste. Three required courses must be selected, plus two electives from the electives list. Each course must carry a minimum of three credits. Students interested in the environmental engineering option should declare their intention during the sophomore year to the department faculty. They may consult with Professor S. S. T. Fan.

Required Courses		
ChE 609	Fundamentals of Air Pollution and Its Control	4
ChE 772	Physicochemical Processes for Water and Air Quality Control	4
CiE 748	Solid Waste Disposal	3
		11
Elective Courses		
ChE 695	Chemical Engineering Project	3-4
ChE 696	Independent Study	3-4
CiE 746	Wastewater Treatment Plant Design	3
CiE 749	Chemistry of Natural Waters	3
		6-8

Chemistry

Students interested in chemistry may major in one of four programs offered in the department, depending upon their plans for a career. Since the required chemistry courses in each degree program are the same in the first year, it is easy to change from one program to another, or even to another major.

In each of the programs, students should register for the following courses in the first year: Chem 405 (first semester), Introductory Chemistry; Chem 406 (second semester), Quantitative Analysis; Math 425 (first semester), Calculus I; and Math 426 (second semester), Calculus II. Students interested in a chemistry program may consult with the coordinator of undergraduate studies in the department.

Bachelor of Science in Chemistry

This curriculum is intended to prepare students for careers as professional chemists and to provide a strong foundation for graduate study in chemistry or in interdisciplinary areas of science calling for a strong background in chemistry. The

Chemistry Department Baccalaureate Degree Requirements

Course		B.S. Degree	B.A., Chemistry Major	B.A., Science Major
405	Introductory Chemistry*	x	x	x
406 & 407, or 517 & 518	Quantitative Analysis	x	x	x
547 & 549, or 651 & 653	Organic Chemistry	x	x	
548 & 550, or 652 & 654	Organic Chemistry	x	x	
683 & 685	Physical Chemistry I	x	x	
684 & 686	Physical Chemistry II	x	x	
762 & 763	Instrumental Methods of Chemical Analysis	x	x	four other chemistry courses chosen from these, except 697 and 698
697	Chemical Literature	x		
698	Seminar	x		
699	Senior Thesis	x	two other chemistry courses chosen from these, except 697 and 698	
755 & 756	Advanced Organic Chemistry	x		
774 & 775	Inorganic Chemistry	x		
776	Physical Chemistry III	x		
663	Introductory Radiochemical Techniques			
708	Research Techniques			
778	Chemistry of Large Molecules			
Other Requirements				
All majors: Math 425 and 426, Calculus I and II.		*B.S. degree:* Phys 407-408, General Physics I and II; Germ 401-402 or 403-404, or Russ 401-402; C S 403 or 410, Introduction to Computer Programming; two chemistry-related courses (only one of which may be a chemistry course).**	*B.A. degree, chemistry major:* Phys 407, General Physics I, or Phys 401-402, Introduction to Physics I and II, or Phys 403-404, Introductory Physics for Biologists.	*B.A. degree, science major:* three approved courses in mathematics or science to complete major requirement; and two other science or mathematics courses to complete University science requirement.

*Chem 403-404 may be substituted for Chem 405, but this is not recommended.
**Suggested courses: Math 527 or 528; Phys 505; E E 620; Bchm 601; Inco 650.

curriculum requires a greater depth in chemistry and physics than do the other degree programs.

Requirements

1. Satisfy General Education Requirements.
2. Language requirement: Much of the chemical literature is in German or Russian and has not been translated. Students must demonstrate a proficiency in one of these languages by completing a year's course in that language. The choice is up to the individual.
3. For specific course requirements, see the accompanying chart.

Bachelor of Arts, Chemistry Major

This curriculum offers students the opportunity to combine a chemistry major with other interests. There are fewer required courses in chemistry and physics, and students have more opportunity to elect courses in other areas according to individual interests. The pre-healing arts students interested in chemistry, those preparing for secondary school teaching, or those interested in business can combine these interests with chemistry in this curriculum.

Requirements

1. Satisfy General Education Requirements.
2. Satisfy the Bachelor of Arts degree (see page 15.)
3. For specific course requirements, see the accompanying chart.

Bachelor of Arts, Science Major, Chemistry Concentration

This curriculum is for students interested in chemistry but wishing a broader exposure to other disciplines than can be obtained in a chemistry major. Students interested in interdisciplinary science or in chemistry as a cultural subject can satisfy their interests in this degree program, which is not intended to prepare professional chemists but, rather, is the basis for a broad liberal education.

Requirements

1. Satisfy General Education Requirements.
2. Satisfy the Bachelor of Arts degree requirements (see page 15).
3. For specific course requirements, see the accompanying chart.

Bachelor of Arts, Chemistry and Physics Teaching

This major is designed for students who wish to teach chemistry and physics in secondary schools. The number of positions available for teaching only chemistry or physics is limited, and there are more opportunities to teach both subjects on the secondary-school level. Chemistry and physics teaching majors will have good preparation for teaching these subjects and will have the necessary mathematics and education background.

Requirements

1. Satisfy General Education Requirements.
2. Satisfy the Bachelor of Arts degree requirements (see page 15).
3. Chemistry requirements: 405, Introductory Chemistry or 403-404, General Chemistry; 406, 407, Quantitative Analysis; 545, 546 or 547-548 and 549-550, Organic Chemistry; 683-684 and 685-686, Physical Chemistry I and II.
4. Physics requirements: 407, General Physics I; 408, General Physics II; 505, General Physics III; 605, Experimental Physics I; and Physics 406, Introduction to Modern Astronomy, strongly recommended.
5. Math requirements: 425, Calculus I, and 426, Calculus II.
6. All education courses in the teacher preparation program (see pages 21–22).

Civil Engineering

Civil engineers are concerned with planning, design, and construction of public and private facilities, including those for: transportation, control, purification, and distribution of water; collection and treatment of waste products; and residential and industrial purposes. Facilities must not only provide safe, efficient service to the users but must, in addition, be compatible with the environment (both natural and human) in which they are placed. Since many of the clients are governmental agencies, civil engineers must secure approval of the citizens involved or their elected representatives.

The program leads to a Bachelor of Science degree in civil engineering. The strong analytical basis of the program prepares graduates for many career opportunities. They may enter professional practice or pursue further study in graduate school. Undergraduates study the basic sciences and mathematics, as well as engineering science, analysis, and design.

Freshman Year		Fall	Spring
CiE 400	CiE Lectures	0	—
Math 425 and 426	Calculus I and II	4	4
Chem 403, 404	General Chemistry	4	4
Engl 401	Freshman English	4	—
Phys 407	General Physics I	—	4
Electives (2)	Group II	4	4
		16	16
Sophomore Year			
CiE 525-526	Mechanics I, II	3	3
CiE 527	Mechanics III	—	3
CiE 505	Surveying	—	4
Phys 408	General Physics II	4	—
Math 527	Differential Equations with Linear Algebra	4	—
Math 528, 644, or 645		—	4
C S 410	Introduction to Computer Programming	4	—
Electives (2)	Group II	4	4
		19	18
Junior Year			
CiE 622	Engineering Materials	4	—
CiE 642	Fluid Mechanics	4	—
CiE 643	Introduction to Environmental Pollution Control	3	—
CiE 681	Structural Analysis	4	—
CiE 623	Systems Analysis	—	3
CiE 644	Water and Wastewater Engineering	—	3
CiE 665	Soil Mechanics	—	4
CiE 682	Structural Design Concepts	—	4
Elective (1)	Group II	—	4
		15	18
Senior Year			
Elective (1)	Group I (Biological Science)	4	—
CiE Elective (5)		11	8
Elective (1)	Group II	—	4
Elective (1)	Any department except CiE	—	4
		15	16

The electives will be chosen to meet requirements of the University, the department, and any option selected. A minimum of 133 total credits is required for graduation.

Civil engineering students must obtain a 2.00 grade-point average in CiE courses as a requirement for graduation.

Environmental Engineering Option Environmental engineering is the application of engineering principles and practices to one or more elements of the environment to protect or improve the quality of life. Environmental engineers use specialized engineering knowledge to systematically manage water, air, and land resources. This option provides fundamental environmental engineering concepts and methods of design and allows specialization in an area of the student's choice.

Four courses (12 credits) are required. At least 8 credits must be selected from the following list, of which a minimum of 4 must be in civil engineering. Courses not on the list may be elected upon approval of the student's adviser.

The option is selected at the beginning of second semester in the junior year and must meet all the previously listed graduation requirements. Interested students may consult with the option adviser, John A. Olofsson.

Required Courses		
Micr 503	General Microbiology	4
CiE 743	Environmental Sampling and Analysis	2
CiE 746	Wastewater Treatment Plant Design	3
CiE 749	Chemistry of Natural Waters	3
		12
Elective courses		
ChE 712	Introduction to Nuclear Engineering	4
CiE 740	Rural Wastewater Engineering	3
CiE 741	Open Channel Flow	3
CiE 745	Hydrology and Hydraulics	3
CiE 748	Solid Waste Disposal	3
CiE 794	Reinforced Concrete Design	4
Chem 545	Organic Chemistry (plus laboratory)	5
Chem 683	Physical Chemistry I	3
ChE 609	Fundamentals of Air Pollution and Its Control	4
Hydr 710	Groundwater Hydrology	4

Constructed Systems Option All structures, regardless of purpose, must be planned, designed, and built to resist the natural forces (gravity, wind, earthquake) and those imposed by people during construction and use of the structure.

Two courses (8 credits) are required. A minimum of 15 credits must be elected from the list on page 54, of which 11 must be in civil engineering; courses not on the list may be elected upon approval of the student's advisor.

The option is selected at the beginning of second semester in the junior year and must meet all the previously listed graduation requirements. Interested students may consult with the option adviser, Louis H. Klotz.

Required Courses (2)

CiE 685	Indeterminate Structures	4
CiE 793 or 794	Structural Design in Steel or Reinforced Concrete Design	4

Electives (4)

Minimum of 11 credits from the following:

CiE 763	Advanced Soil Mechanics I	4
CiE 765	Foundation Engineering	4
CiE 782	Timber Design	2
CiE 784	Structural Analysis by Matrix and Numerical Method	4
CiE 785	Introduction to Structural Vibrations	3
CiE 790	Inelastic Structural Design	4
CiE 793 or 794	Structural Design in Steel or Reinforced Concrete Design	4

Minimum of 4 credits from the following:

Arts 455	Architectural Drafting and Design	4
ESci 401 or 402	Principles of Geology I or II	4
Math or C S	(any 600 course or above)	4
M E 441	Engineering Graphics	4
M E 727	Advanced Mechanics of Solids	4
Hydr 603	Hydrology and Water Management	4

Earth Sciences

The courses offered in the Department of Earth Sciences cover the broad spectrum of geology and oceanography. They encompass a group of related studies concerned with an understanding of the size, shape, and constitution of the earth; the processes that are now, or have formerly been, at work upon its surface, in its oceans, and within its interior; its origin; and evolution of life upon it.

The need for people trained in the earth sciences has been emphasized by the search for new and additional energy sources and essential mineral resources, by the increased concern with intelligent management of the environment, and by expansion of research in both oceanography and extraterrestrial geology. In addition, the demand for well-trained secondary teachers of earth sciences has steadily increased over the past few years.

Four undergraduate degree programs are offered through the Department of Earth Sciences. Students interested in an earth sciences program may consult with the department chairperson, Herbert Tischler.

Bachelor of Science in Geology

This program represents the strongest concentration in the earth and cognate sciences and is especially well suited for students who plan to continue their studies in graduate school. Beyond a central core of courses, there is sufficient flexibility in course selection so that students may, in consultation with their academic advisers, orient the program toward a particular facet of the earth sciences (e.g., mineralogy-petrology, oceanography, geomorphology, paleontology-stratigraphy, etc.).

Requirements

1. Satisfy the General Education Requirements.
2. Satisfactorily complete Math 425 and 426, Chem 403-404, and Phys 407-408.
3. Complete a minimum of 12 courses in earth sciences, which should include: ESci 401-402, Principles of Geology; ESci 501, Introduction to Oceanography; ESci 512, Descriptive and Determinative Mineralogy; ESci 531, Structural Geology; ESci 561, Geomorphology; ESci 613, Principles of Mineralogy; ESci 614, Petrography; ESci 652, Invertebrate Paleontology; ESci 754, Sedimentation-Stratigraphy; and two approved earth sciences electives.
4. Complete Mathematics 527 and 528 or approved electives.
5. Complete two additional approved electives.

Bachelor of Arts, Geology Major

This program offers students an opportunity to obtain a broad liberal education and a general background in geology with a greater degree of freedom in choosing electives than in the Bachelor of Science program. By a careful choice of electives, students can prepare for graduate school, business, or industry.

Requirements

1. Satisfy the General Education Requirements.
2. Satisfy the Bachelor of Arts degree requirements (page 15).
3. Complete a minimum of eight courses in the department with a C− (1.67) or better, which should include: ESci 401-402, Principles of Geology; ESci 512, Descriptive and Determinative Mineralogy; and five upper-level earth sciences courses, two of which must be chosen from courses numbered 700 or above.
4. Math requirements: 425, Calculus I, and 426, Calculus II.

It is strongly advised that students complete, as early as possible, a year each of college chemistry and physics.

It is also suggested that students include Hist 521-522, History of Science, in their program.

Bachelor of Arts, Science Major, Earth Sciences Concentration

This program is for the student who wants a liberal education with a scientific slant to it. It is not designed to produce professional scientists but rather combines the liberal arts with a reasonable exposure to science in general and to earth sciences in particular.

Requirements

1. Satisfy the General Education Requirements.
2. Satisfy the Bachelor of Arts degree requirements (page 15).
3. Complete: ESci 401-402, Principles of Geology; ESci 501, Introduction to Oceanography; and three approved earth sciences electives.
4. Math requirements: 425, Calculus I, and 426, Calculus II.
5. Additional major requirements: three approved courses in science over and above those used to satisfy University General Education Requirements.

Bachelor of Arts, Earth Science Teaching Major

This program is specifically designed to prepare students to teach earth sciences in secondary school. Upon graduation from this program, students receive a full teacher certification which is recognized in most states.

Requirements

1. Satisfy the General Education Requirements.

2. Satisfy the Bachelor of Arts degree requirements (page 15.).

3. Complete: ESci 401-402, Principles of Geology; ESci 501, Introduction to Oceanography; Geog 473, The Weather; Chem 401-402, General Chemistry; Phys 401-402, Introduction to Physics I and II (or Phys 403-404); Phys 406, Introduction to Modern Astronomy; plus 12 approved elective credits from intermediate and/or advanced earth sciences courses.

4. Math requirements: 425, Calculus I, and 426, Calculus II.

5. Satisfy the secondary-school teacher education program. (See "Preparing for Teaching," pages 21,22.)

Electrical and Computer Engineering

Electrical and computer engineers are designing systems for investigating the ocean, for monitoring medical procedures, and for processing information from outer space. They develop electronic instrumentation for environmental protection, design mini- and microcomputers for industry, and use their knowledge to help solve such major problems of society as transportation, pollution, and health care delivery.

At UNH, the keynote of the electrical and computer engineering program is the involvement of students in the solution of real-world problems. During the freshman and sophomore years, students take basic courses in mathematics and physics, learn how to use the computer, and receive introductory experience in electric circuits, logic design, and electronics.

The electrical and computer engineering curriculum prepares students for graduate work in electrical engineering, for productive employment as electrical engineers, and for graduate work in related areas such as business administration. It is compatible with the dual-degree program described on page 15.

Electrical engineering students must obtain a 2.00 grade-point average in E E courses as a requirement for graduation.

Basic Curriculum for Bachelor of Science in Electrical Engineering

Students, with their advisers' assistance, should plan their programs based on the following distribution of courses for a total of 133 credits. This curriculum applies to students who will be freshmen, sophomores, or juniors as of September, 1980. Students who have not had a year of high school chemistry with a grade of B or better are required to take Chem 403 sometime during their college program. For those students, 137 credits are required for graduation.

First Two Years Are Common to All Options

Freshman Year		Fall	Spring
Core Courses			
Math 425 and 426	Calculus I and II	4	4
Engl 401	Freshman English	—	4
Elective	Life science elective	4	—
C S 410	Introduction to Computer Programming	—	4
Phys 407	General Physics I	—	4
Electives (2)	Group II	8	—
		16	16

Sophomore Year			
Core Courses			
Math 527	Differential Equations with Linear Algebra	4	—
E E 544	Signal Processing Fundamentals	—	3
Phys 408, 505	General Physics II and III	4	4
E E 541	Electrical Circuits	4	—
E E 543	Introduction to Digital Systems	4	—
E E 548	Circuits and Electronics	—	4
M E 525	Mechanics I	—	3
Elective (1)	Group II	—	4
		16	18

Junior Year			
Core Courses			
E E 545	Electrical Networks	3	—
E E 551	Advanced Electronics I	3	—
E E 546	Probability and Discrete Systems	—	3
E E 603	Electromagnetic Fields and Waves I	3	—
E E 517-518	Junior Laboratory I and II	1	3
E E 656	Electromechanical Devices	—	3
Electives (2)	Group II	4	4
E E 612	Logical Design of Digital Computers	4	—
	Subtotal	18	13
Computer Engineering Option			
E E 714	Minicomputer Applications Engineering	—	4
	Total	18	17
Electrical Engineering Systems Option			
E E 552	Advanced Electronics II	—	4
	Total	18	17

Senior Year			
Core Courses			
Elective (1)	Group II	4	—
M E 505	Introduction to Thermodynamics and Heat Transfer	—	4
Electives (2)	Non-E E elective	4	—
	Technical elective	—	4
	Subtotal	8	8
Computer Engineering Option			
C S 710	Advanced Programming Systems	—	4
E E 711	Digital Systems	4	—
E E 757 or 782		4	or 4
Electives	Approved professional elective	4	or 4
	Total	16	16
Electrical Engineering Systems Option			
E E 757	Fundamentals of Communications	4	—
E E 782	Control Systems	—	4
Electives	Approved professional electives	4	4
	Total	16	16

Options and Minors

In the junior year, students complete the core courses and begin studying in a chosen option. Students must choose one of the three options and additionally may elect one of the various minors (see pages 45–47 for descriptions of minors). The options, which are described in the following paragraphs, provide for professional electives so that individual student interests may be pursued. In addition, the senior year features many opportunities for individual or group projects. Each option is made up of five courses.

Computer Engineering Option During the past several years, advances in the technology of electronic circuit manufacture have vastly reduced the costs of digital computers. This low cost, coupled with flexibility, has allowed them to be used in a

broad variety of applications, from data processing in a small retail store to controlling a machine tool in a manufacturing plant. Since computers are basically electronic devices, it is primarily the job of electrical engineers to design or specify the purchase of the computer and integrate it into larger systems. To do so requires a knowledge of both hardware (circuits) and software (programming) concepts. In this option, students will learn to design, build, and test systems involving digital computers.

Required Courses: E E 711, E E 714, C S 710.

Elective Courses: E E 757 or E E 782; and one approved professional elective chosen in consultation with the adviser to meet students' professional objectives.

Electrical Engineering Systems Option The electrical engineering systems option provides students with the fundamentals of communication, control, and computer systems. An effort is made to balance both the theory and the applications so that students will appreciate both system development and system implementation. In addition to the four required courses, there are three additional professional elective courses that allow students to delve further into areas of interest.

Required Courses: E E 552, E E 757, and E E 782.

Elective Courses: Two courses chosen in consultation with the adviser to satisfy students' and programmatic goals.

Student-Designed Option This option is for the unusual student whose grade-point average is at least 2.7 and who has well-defined academic goals that cannot be satisfied by either of the regular options. The student and adviser will prepare an option proposal which will include a statement of the student's goals and a listing of the option courses that will be taken. Each student's proposal will require approval by the department's Undergraduate Committee.

Engineering Technology

Engineering technology is the part of the engineering field that requires the application of engineering and scientific knowledge and methods combined with technical skills in support of engineering activities. Normally engineering technology is not concerned with the development of new principles and methods. The Engineering Technology Program offers only junior- and senior-level work. Students admitted to this program must have an appropriate associate degree from the New Hampshire Technical Institute, the Vermont Technical College, or an equivalent school.

Curricula in electrical engineering technology and mechanical engineering technology are offered. Students may continue study in their field of specialization, select electives which broaden their educational background, and participate in project courses where, as part of a technology team, their talents are applied in solving real problems.

Students interested in an engineering technology program may consult with the program director, Donald W. Melvin.

Electrical Engineering Technology

Junior Year		Fall	Spring
E T 671	Digital Systems	—	4
E T 677	Analog Systems	4	—
E T 637	Heat and Fluid Power I	4	—
E T 674	Control Systems and Components	4	—
E T 680	Communications and Fields	—	4
C S 410	Introduction to Computer Programming	—	4
Electives (2)		4	4
		16	16
Senior Year			
E T 691	Electrical Engineering Technology Project	4	4
E T 633	Industrial Organization and Law	4	—
E T 634	Economics of Business Activities	—	4
E T 690	Microcomputer Technology	4	—
Electives (3)		4	8
		16	16

Mechanical Engineering Technology

Junior Year		Fall	Spring
E T 637 and 638	Heat and Fluid Power I and II	4	4
E T 641	Production Systems	4	—
E T 675 and 676	Electrical Technology I and II	4	4
E T 644	MET Concepts in Design and Analysis	—	4
Electives (2)		4	4
		16	16
Senior Year			
E T 651	Mechanical Engineering Technology Project	4	4
E T 633	Industrial Organization and Law	4	—
E T 634	Economics of Business Activities	—	4
E T 695	Independent Study	4	—
Electives (3)		4	8
		16	16

Mathematics and Computer Science

Seven undergraduate programs are offered through the Department of Mathematics and Computer Science. Normally, students will enter one of these specific programs; however, with two exceptions, they may change programs at any time. The exceptions are that enrollments in the B.S. in Computer Science and in the interdisciplinary B.S. with computer science option are limited. Transfer into either of these programs is on a space-available basis only and cannot be guaranteed. Students who take C S 410 and Math 425 and 426 in the freshman year are on schedule in any of the seven programs in the department. The normal sophomore courses are Math 527, 528, and 531. This sequence meets all major requirements at the sophomore level in five of the seven programs. The B.S. in Mathematics Education (elementary option) has a completely different sophomore program, while the B.S. in Computer Science requires Math 527 and C S 611 and 612 in the sophomore year.

In some programs, there are courses outside the department that should be completed in the sophomore year. These are noted in the detailed lists of requirements that follow.

A major in the department may not use departmental courses to satisfy Group I

General Education Requirements. However, a student in the Bachelor of Science in Computer Science program may use in Group III any mathematics course not used to satisfy major requirements, and a student in any other program in the department may use in Group III any computer science course not used to satisfy major requirements.

Students interested in a mathematics and computer science program may consult with the department chairperson, M. Evans Munroe.

Bachelor of Science in Mathematics

This program represents the strongest concentration in mathematics of any program offered by the department. Included among the required courses are those usually required for admission to graduate work in mathematics. Through a judicious choice of electives, students may construct a stronger pregraduate program, or they may slant the program toward a career in business or industry.

Requirements

1. General Education Requirements must be satisfied, and Phys 407-408 must be included among the science courses.
2. Language requirement: Students must demonstrate proficiency in one of the three languages: French, German, or Russian. (See B.A. requirements, page 15.)
3. Departmental requirements: C S 410, Introduction to Computer Programming; Math 425, Calculus I; Math 426, Calculus II; Math 527, Differential Equations with Linear Algebra; Math 528, Multidimensional Calculus; Math 531, Introduction to Abstract Mathematics; Math 761, Abstract Algebra; Math 762, Linear Algebra; Math 767, One-dimensional Real Analysis; Math 784, Topology; Math 788, Complex Analysis; and three approved mathematics or computer science electives.

Bachelor of Arts, Mathematics Major

This program offers a broader liberal education than do any of the Bachelor of Science programs. By a careful choice of electives, however, students can shape this major into a preparation for graduate school, business, or industry.

Requirements

1. Satisfy General Education Requirements.
2. Satisfy Bachelor of Arts degree requirements (page 15).
3. Departmental requirements: Math 425, Calculus I; Math 426, Calculus II; Math 527, Differential Equations with Linear Algebra; Math 528, Multidimensional Calculus; Math 531, Introduction to Abstract Mathematics; Math 761, Abstract Algebra; Math 762, Linear Algebra; Math 767, One-dimensional Real Analysis; and three approved mathematics or computer science electives.

Bachelor of Arts, Science Major, Mathematics Concentration

This program is for students who want a liberal education with a scientific slant to it. It is not designed to produce professional scientists but, rather, combines the liberal arts with a reasonable exposure to science in general and mathematics in particular.

Requirements

1. Satisfy General Education Requirements.
2. Satisfy Bachelor of Arts degree requirements (page 15).
3. Departmental requirements: C S 410, Introduction to Computer Programming; Math 425, Calculus I; Math 426, Calculus II; Math 527, Differential Equations with Linear Algebra; Math 528, Multidimensional Calculus; Math 531, Introduction to Abstract Mathematics; Math 761, Abstract Algebra, or Math 767, One-dimensional Real Analysis; and one approved mathematics or computer science elective.
4. Additional major requirements: three approved courses in science over and above those used to satisfy General Education Requirements.

Bachelor of Science in Mathematics Education

This is a professional degree program to prepare students for teaching mathematics at the elementary or secondary level. The program is coordinated with the education department's five-year, teacher-certification program. Students may complete the degree requirements in four years; however, to receive full teacher certification a year-long teaching internship in the fifth year is required. (The internship can be coupled with other graduate work leading to a master's degree.) See "Preparing for Teaching," page 22.

Requirements

1. Satisfy General Education Requirements.
2. Education requirements: Educ 500, Exploring Teaching; Educ 700, Educational Structure and Change; Educ 701, Human Learning and Development; Educ 705, Alternative Perspectives on the Nature of Education.
3. Requirements for the elementary or secondary option.

Elementary Option

1. Degree requirements 1 and 2 above.
2. Departmental requirements: C S 410, Introduction to Computer Programming; Math 419, Evolution of Mathematics; Math 425, Calculus I; Math 426, Calculus II; Math 621, 622, 623, Number Systems, Geometry, and Topics for Elementary School Teachers; Math 636, Probability and Statistics; Math 657, Geometry I; Math 703, Mathematics Education, K-6; Math 791, Mathematics Education; one approved mathematics or computer science elective.
3. Additional major requirements: Phys 406, Introduction to Modern Astronomy; Educ 706, Introduction to Reading.

Secondary Option

1. Degree requirements 1 and 2 above.
2. Departmental requirements: C S 410, Introduction to Computer Programming; Math 425, Calculus I; Math 426, Calculus II; Math 527, Differential Equations with

Linear Algebra; Math 528, Multidimensional Calculus; Math 531, Introduction to Abstract Mathematics; Math 636, Probability and Statistics; Math 657, Geometry I; Math 698, Senior Seminar; Math 761, Abstract Algebra; Math 791, Mathematics Education; and two approved mathematics or computer science electives.

Bachelor of Science in Computer Science

This program is designed to prepare students for employment in the computer field or to pursue graduate study in computer science. The program places principal emphasis on software system design and development but also includes a broad background in basic mathematics and an introduction to computer hardware.

Requirements

1. Satisfy General Education Requirements.
2. Mathematics requirements: Math 425, Calculus I; Math 426, Calculus II; Math 527, Differential Equations with Linear Algebra; Math 531, Introduction to Abstract Mathematics; Math 644, Applied Probability and Statistics; Math 753, Numerical Methods and Computers I.
3. Computer science requirements: C S 410, Introduction to Computer Programming; C S 611, Assembler-Language Programming; C S 612, Data Structures and Processes; C S 710, Advanced Programming Systems; C S 711, Programming Languages and Compiler Construction.
4. Computer engineering requirements: E E 531, Elements of Digital Systems; E E 712, Logical Design of Digital Computers.
5. Additional major requirements: three approved electives in mathematics, computer science, or computer engineering.

Bachelor of Science Interdisciplinary Programs in Mathematics and Its Applications

These programs are designed to prepare students for employment in various areas of applied mathematics. Certain of them also lead to graduate work in appropriate fields (e.g., chemical physics, computer science, economics). In this program, the major may consist of mathematics combined with any one of the following disciplines: chemistry, computer science, economics, electrical science, fluid dynamics, mechanics, thermodynamics, and physics.

Requirements

1. Satisfy General Education Requirements.
2. Core requirements: C S 410, Introduction to Computer Programming; Math 425, Calculus I; Math 426, Calculus II; Math 527, Differential Equations with Linear Algebra; Math 528, Multidimensional Calculus; and Math 645, Applied Linear Algebra.
3. Additional mathematics requirements:

In Mathematics-Computer Science: four approved mathematics electives. Proper choice of these depends mainly on the students' career objectives. These electives should be chosen only in consultation with a faculty adviser designated by the department.

In Mathematics-Economics: Math 735, Probability; Math 736, Statistics; and two approved mathematics electives.

In all other options: Math 646, Analysis for Applications; Math 647, Complex Analysis for Applications; and two approved mathematics electives.

4. Requirements in other disciplines: Each interdisciplinary major consists of 10 mathematics courses (see above) plus five courses in the other discipline. Specific requirements follow. If more than five courses outside of mathematics are required or elected, the excess may be used to satisfy appropriate General Education Requirements.

Mathematics—Chemistry Option Chem 405, Introductory Chemistry; Chem, 683, Physical Chemistry I, *and* Chem 685, Physical Chemistry Laboratory (these two courses regarded as a single unit); Chem 684, Physical Chemistry II, *and* Chem 686, Physical Chemistry Laboratory (these two courses regarded as a single unit); Chem 776, Physical Chemistry III; *either* Phys 701, Introduction to Quantum Mechanics I, *or* Chem 774, Inorganic Chemistry.

Note: Chem 547-548, Organic Chemistry, suggested as elective for those planning to do graduate work in chemical physics. Chem 405 should be taken no later than the sophomore year.

Mathematics—Computer Science Option A total of five of the following courses, including at least one from each of the following three groups: Group 1, C S 611, Assembler-Language Programming; C S 612, Data Structure and Processes; C S 710, Advanced Programming Systems; C S 711, Programming Languages and Compiler Construction. Group 2: Math 753 and 754, Numerical Methods and Computers I and II. Group 3: E E 531, Elements of Digital Systems; E E 612, Logical Design of Digital Computers; E E 711, Digital Systems; E E 714, Minicomputer Applications Engineering.

Mathematics—Economics Option Econ 401 and 402, Principles of Economics (Macro, Micro); Econ 605, Intermediate Microeconomic Analysis; Econ 611, Intermediate Macroeconomic Analysis; and any two of the following three courses: Econ 727, Econometric Theory; Admn 705, Operations Research; Econ 737, Decision Theory and Bayesian Methods.

Note: Econ 401 and 402 should be taken no later than the sophomore year.

Mathematics—Electrical Science Option E E 541, Electrical Circuits; E E 603 and 604, Electromagnetic Fields and Waves I and II; E E 757, Fundamentals of Communications; E E 782, Control Systems.

56

Mathematics—Fluid Dynamics Option M E 503, Thermodynamics I; M E 508, Fluid Dynamics; M E 525, Mechanics I; M E 707, Analytical Fluid Dynamics; M E 708, Gas Dynamics

Mathematics—Mechanics Option M E 503, Thermodynamics I; M E 525, 526, 527, Mechanics I, II, and III; any two of the following three courses: M E 723, Advanced Dynamics; M E 724, Vibration Theory and Applications; and M E 727, Advanced Mechanics of Solids.

Mathematics—Physics Option Phys 407-408, General Physics I and II; Phys 505, General Physics III; and *either* Physics 701-702, Introduction to Quantum Mechanics I and II; *or* Phys 703-704, Electricity and Magnetism I and II.

Note: Phys 407-408 should be taken no later than the sophomore year.

Mathematics—Thermodynamics Option M E 503, Thermodynamics I; M E 508, Fluid Dynamics; M E 525, Mechanics I; and any two of the following three courses: M E 701, Macroscopic Thermodynamics; M E 702, Statistical Thermodynamics; M E 703, Heat Transfer.

Mechanical Engineering

Mechanical engineering is a challenging profession encompassing research, design, development, and production of aerospace vehicles, underwater vessels, instrumentation and control systems, nuclear and conventional power plants, and consumer and industrial products in general. The profession also makes contributions through more fundamental studies of material behavior, the mechanics of solids and fluids, and energy transformation.

The curriculum in mechanical engineering is designed to prepare prospective graduates either for more advanced studies or for beginning professional engineering careers. The program of study provides a foundation in the basic physical sciences, mechanics of solids and fluids, dynamic systems, thermal sciences, materials science, and design. Flexibility in the curriculum enables students to gain competence in any of these specific areas, developing abilities in analysis, experimentation, and engineering design. The curricula include elective courses in the arts, the humanities, and the social sciences to provide a liberal education.

The program in mechanical engineering is further designed to develop the creative potential to meet increasingly complex needs of industry, government, and education, while appreciating the role of technology in a modern society.

Students, with their advisers' assistance, should plan a program based on the following distribution of courses, which average 16 credit hours per semester, and totaling not less than 128 credits.

The outline that follows is to be considered as being typical only in terms of format. Within the constraints of satisfying all of the requirements and having all necessary prerequisites, schedules may vary. Such variation will, in general, be caused by scheduling needs or student preference.

Electives should be selected in consultation with a departmental adviser from courses that will lead to a balanced program in the chosen area of interest. The free electives are entirely students' own choice. Technical elective requirements are four courses of at least three credits each.

Freshman Year		Fall	Spring
Engl 401	Freshman English	4*	—
Chem 405**	Introductory Chemistry	—	4*
Math 425 and 426	Calculus I and II	4	4
Phys 407-408	General Physics I and II	4	4
Elective	Any approved biological science	—	4*
M E 441	Engineering Graphics	4*	—
		16	16
Sophomore Year			
Math 527	Differential Equations with Linear Algebra	4	—
Math 528	Multidimensional Calculus	—	4
M E 525-526	Mechanics I and II	3	3
E E 541	Electrical Circuits	4	—
E E 548	Circuits and Electronics	—	4
M E 561	Introduction to Materials Science	3	—
M E 561 L	Introduction to Materials Science Laboratory	1*	—
M E 503	Thermodynamics I	—	4
Electives (2)	Arts and humanities or social science	4	4
		19	19
Junior Year			
M E 527	Mechanics III	3	—
M E 628	Introduction to Vibrations	—	3
M E 508	Fluid Dynamics	4	—
M E 703	Heat Transfer	—	3
C S 410	Introduction to Computer Programming	4	—
M E 648	Introduction to Measurement and Experimental Methods	—	3
Electives (2)	Arts and humanities or social science	4	4
Elective (1)	Technical elective	—	3 (4)
		15	16(17)
Senior Year			
M E 771	Dynamic Systems Modeling	3	—
M E 695	Senior Design	3	—
Electives (3)	Technical electives	3 (4)	6 (8)
Electives (2)	Arts and humanities or social science	4	4
Elective (1)	"Free" elective	3 (4)	3 (4)
		13(15)	13(16)

*To facilitate scheduling, many students may be required to take this course in the alternate semester.

**Students whose preparation in chemistry is weak may be required to take a full year of chemistry, i.e., Chem 403-404.

Energy Option Many mechanical engineering graduates traditionally pursue professional careers in areas that are related to energy generation, conversion, or use. Increased emphasis on energy conservation and the development of alternate energy sources has created challenging and rewarding opportunities for graduates having a strong interest and capability in these fields. The Department of Mechanical Engineering offers a formal energy option intended to promote the development of well-planned student programs with special emphasis on courses applicable to career goals in energy related industries. This program of five courses, open to mechanical engineering majors, emphasizes those subjects necessary for an understanding of the engineering aspects of energy systems and related problem areas. Students electing the energy option should do so during the first semester of the junior year and have their program approved by a department faculty member involved in the option. To have the energy option shown on transcripts, students

should file appropriate forms with the dean's office during the first semester of the junior year.

Required Courses	
(Minimum of four including M E 697)	
M E 504	Thermodynamics II
M E 697	Seminar (energy topics section)
M E 710	Solar Heating Systems
ChE 705	Natural and Synthetic Fossil Fuel
ChE 712	Introduction to Nuclear Engineering
Electives (1)	
M E 708	Gas Dynamics
M E 695A	Undergraduate Projects and Independent Study (Thermal Science)

Physics

Physics is concerned with the properties of matter and the laws that describe its behavior. It is an exact science based on precise measurement, and its objective is the kind of understanding that leads to the formulation of mathematical relationships between measured quantities. As a fundamental science, its discoveries and laws are basic to understanding in nearly all areas of science and technology. Advances in such diverse fields as diagnostic medical techniques, transistors, and air pollution have relied heavily on the application of basic physical laws and principles.

Students interested in the study of physics at the University of New Hampshire will find a strong interaction between research and academic programs. Undergraduates have participated in research studies ranging from atomic spectroscopy using laser sources to astrophysical studies of the solar system using space probes. These experiences have proven beneficial to engineering and physics students alike. The department has its own library, which provides a comfortable, inviting atmosphere for study and relaxed reading.

The suggested programs that follow are indicative of the flexibility available to students, whether they are preparing for graduate work in physics, industrial opportunities, governmental research, secondary-level teaching, or a general education that might utilize the fundamental knowledge of physics.

The following undergraduate degree programs are offered through the Department of Physics. Interested students may consult with the department chairperson, Robert E. Houston, Jr.

Bachelor of Arts, Science Major, Physics Concentration

This is the most flexible degree offered by the department. It is not designed to produce a professional physicist but, rather, to provide an opportunity for interdisciplinary combinations with emphasis on physics.

Requirements

1. Satisfy General Education Requirements.
2. Satisfy Bachelor of Arts degree requirements (page 15).
3. Physics requirements: six courses approved by the department.
4. Math requirements: 425, Calculus I, and 426, Calculus II.
5. Any three approved courses in science not used to satisfy other University requirements.

Bachelor of Arts, Physics Major

This degree provides an opportunity for a broad and liberal education, which in some cases may be sufficient for graduate work. A judicious choice of electives may also prepare students in a restricted area in physics in conjunction with other disciplines or other less technical applications in the field of physics.

Requirements

1. Satisfy General Education Requirements.
2. Satisfy Bachelor of Arts degree requirements (page 15).
3. Phys 407-408; 505. Note that Math 425 and 426 are prerequisites for some of the courses. Under special circumstances, 401-402 or 403-404 may be substituted for 407.
4. Five additional courses in physics approved by the department, three of which must be at the 500 level or above.
5. Math requirements: 425, Calculus I, and 426, Calculus II.

Bachelor of Arts, Chemistry and Physics Teaching

For information, see page 49.

Bachelor of Science In Physics

This degree is the professional program offered by the department. The required courses are those necessary for admission to graduate work or a career in industry. Additional courses may be beneficial for graduate preparation or may be desirable for more depth in certain areas of physics. Students are strongly advised to demonstrate proficiency in French, German, or Russian.

Requirements

1. Satisfy General Education Requirements.
2. Satisfy Bachelor of Science requirements (page 45).
3. One course in English is required in addition to the University requirement.
4. Minimum physics requirements: 407, General Physics I; 408, General Physics II; 505, General Physics III; 516, Physical Mechanics; 602, Thermal Physics; 605, Experimental Physics I; 606, Experimental Physics II; 705, Experimental Physics III; 701-702, Introduction to Quantum Mechanics I and II; and 703-704, Electricity and Magnetism I and II.
5. Chemistry: 403-404; or Chem 405.
6. Math: 425-426; 527-528; plus two approved electives. (C S 410 strongly suggested.)

Physics Electives

Additional physics courses may be selected from the following: 607,* Optics; 706,** Experimental Physics IV; 613, 614, Special Topics I and II; 618,* Introduction to Solid State Physics; 695, 696, Independent Study; 710, Introduction to Modern Cosmology.

*May be substituted for Phys 602 upon approval of the department.
**May be substituted for Phys 705 at any time.

Suggested Curriculum for Bachelor of Science Degree in Physics

Freshman Year		Fall	Spring
Phys 407-408	General Physics I and II	4	4
Math 425 and 426	Calculus I and II	4	4
Chem 403-404 (or Chem 405 and Elective)	General Chemistry	4	4
Engl 401	Freshman English	4	—
Elective	Arts/humanities	—	4
		16	16
Sophomore Year			
Phys 505	General Physics III	4	—
Phys 516	Physical Mechanics	—	4
Math 527	Differential Equations with Linear Algebra	4	—
Math 528	Multidimensional Calculus	—	4
Engl Elective	Any English course	4	—
C S 410	Introduction to Computer Programming	—	4
Electives (2)	Social science	4	4
		16	16
Junior Year			
Phys 602 (607*; 618*)	Thermal Physics (Optics; Solid State)	4	—
Phys 701	Quantum Mechanics I	—	4
Phys 605-606	Experimental Physics I and II	4	4
Biol Elective	Any Group I approved course	—	4
Math 646 or Math elective)	Analysis for Applications	4	—
Electives (2)	Arts/humanities	4	4
		16	16
Senior Year			
Phys 702	Quantum Mechanics II	4	—
Phys 703-704	Electricity and Magnetism I and II	4	4
Phys 706**	Experimental Physics IV	—	4
Electives (2)	Unrestricted	4	4
Electives (2)	Unrestricted	4	4
		16	16

*May be substituted for Phys 602 upon approval of the department.
**May be substituted for Phys 705 at any time.

School of Health Studies

59

Basil J. F. Mott, Dean
Frances A. Mahoney, Associate Dean

Departments and Programs

Communication Disorders
Health Administration and Planning
Medical Technology
Nursing
Occupational Therapy
Physical Education
Recreation and Parks

Programs of Study

Bachelor of Science

Communication Disorders
Health Administration and Planning
Medical Technology
Nursing
Occupational Therapy
Physical Education
- Teacher Certification
- Athletic Training
- Exercise Specialist in Health Maintenance
- Pre–Physical Therapy
- Sports Communication

Recreation and Parks
- Recreation Administration
- Park Management

60

Purposes and Programs

The School of Health Studies, established in 1968, is one of the newest academic components of the University. It was created in response to the growing need for programs in higher education that prepare young men and women for health and health-related careers. Currently, the school offers undergraduate instruction leading to the Bachelor of Science degree in communication disorders, health administration and planning, medical technology, nursing, occupational therapy, physical education, and recreation and parks. Each program has been designed to enable students to acquire the basic knowledge and skills needed to practice their chosen professions, while at the same time obtaining a broad cultural background in the humanities and social sciences.

Degree Requirements

Candidates for the B.S. degree must satisfy all General Education Requirements for graduation as listed on page 13; earn at least 128 credits; successfully complete the courses required in one of the curricula desrribed in this chapter; and achieve the required minimum grade-point average in the chosen curriculum. Generally, courses are to be completed in the sequence in which they are arranged.
Minors: See page 16 for requirements.
Dual-Degree Programs: See page 15 for requirements.
Student-Designed Majors: See page 72 for requirements.
Second Majors: See page 16 for requirements.

Student Liability Insurance All students whose programs require participation in clinical learning experiences must purchase and maintain liability insurance for the entire clinical experience. Proof of such insurance coverage must be furnished to the department before the clinical experience begins. The University has arranged for appropriate insurance coverage at a modest cost to students. Further information may be obtained at students' major department office.

Programs of Study

Communication Disorders

Communication disorders is the profession devoted to helping people overcome disabilities of speech, language, or hearing. Specialization in communication disorders begins in the freshman year. Students learn about speech, language, and hearing disorders in the usual classroom setting and then become involved in clinical practice. This opportunity is provided in an on-campus clinic and in schools and community rehabilitation clinics off campus. Students are encouraged to take elective courses in psychology, sociology, and human development.

Students' professional education should be continued at colleges or universities offering graduate programs leading to a master's degree and to subsequent certification by the American Speech and Hearing Association. Certified clinicians find employment opportunities in hospitals, schools, community speech and hearing clinics, or private practice.

Students in the Communication Disorders Program must: 1) complete a course in statistics; 2) obtain at least a 2.67 grade-point average in their first three communication disorders courses; and 3) maintain a minimum 2.75 grade-point average in all communication disorders courses. The required courses in communication disorders, which all students in the program must successfully complete, are: 520, Survey of Communication Disorders; 521, Anatomy and Physiology of the Speech and Hearing Mechanism; 524, Applied Phonetics of American English; 631, Speech Pathology I; 632, Speech Pathology II; 634, Clinical Practice in Speech Pathology; 638, the Acquisition of Language; and 704, Basic Audiology. Other elective courses are available.

Students interested in this program should consult with the chairperson, Associate Professor F. Harry Tokay.

Health Administration and Planning

Students in the Health Administration and Planning Program are prepared to embark upon administrative and planning careers in health care agencies. Graduates work in various settings, such as medical centers, hospitals, long-term care facilities, official health agencies, community mental health centers, family planning agencies, insurance agencies, home health agencies, neighborhood health centers, environmental health agencies, and regulatory agencies.

The academic program is interdisciplinary, with undergraduates taking courses in many academic units of the University. Students gain a broad view of health and develop analytical skills in such areas as economics, politics, and management—all applicable to health organizations. The curriculum is organized to assist students in developing competencies in five areas. A list of these competencies is available from the program office.

Two plans are available for achieving the competencies required for graduation: the academic program for full-time students who have recently graduated from high school and the adult experiential option designed primarily for individuals who have substantial professional experience and desire to pursue the course of study while maintaining their professional affiliation.

Academic Program for Full-time Students

Competencies are achieved through four components of the curriculum: University General Education Requirements, core area, special interest area, and collateral studies. Students must work closely with their assigned advisers to develop a plan of study for each of these components.

General University Requirements Advisers can assist students in selecting courses that will satisfy certain program expectations and simultaneously meet University General Education Requirements.

Core Area Students will enroll in: 1) introductory courses: HAP 401, Health Care Systems; HAP 402, Public Health and Human Ecology; HAP 502, Health and Medical Concepts; and 2) integrative courses: HAP 601, Administrative Problems in Health Organizations; HAP 611, Health and Social Planning; HAP 704, Financial Management of Health Care Institutions; HAP 600, Special Topics in Health Studies (each year juniors will select two one-credit courses taught by the program faculty, which may be used to complement their plan of study); HAP 701, Health Policy and Program Analysis; HAP 702, Health and Human Services: Interorganizational Relationships; and HAP 793-794, Senior Seminar.

Special Interest Area Students will select a health institution or a planning or administrative function within it as an area of focus. This selection usually occurs during the fall of the junior year, before the field practicum. The ten-week field practicum, an essential part of the academic program, helps integrate classwork through a supervised work experience and allows students to explore an area of special interest in depth. Courses include: HAP 621, Health Administration and Planning Prepracticum Seminar; HAP 622, Health Administration and Planning Field Practicum; and HAP 624, Health Administration and Planning Postpracticum Seminar.

Electives are selected, with the guidance of the adviser, to increase an understanding of the special interest area.

Collateral Area A basic understanding is expected in the following areas: economics, political science, organizations, accounting, and statistics. Advisers will work with students to select the courses appropriate for their interests.

Program Review The faculty reviews student performances during the semester before the practicum to determine their readiness.

Experiential Option for Adult Learners: EXCEL

This option is designed to make the B.S. with a major in health administration and planning more accessible to mature learners, many of whom have already begun a health care career. Previous learning experiences are assessed in relation to competencies established as part of degree requirements through HAP 700—Competency Assessment. Innovative educational technologies are used to aid independent learning. Many adult learners pursue the degree while continuing to work full time without living in the Durham area. Students interested in the program should consult with the chairperson.

Medical Technology

Medical technology is a challenging and rewarding profession for students interested in laboratory medicine. Working with pathologists and other physicians, medical technologists are vital members of the health team, performing various medical laboratory procedures and providing the diagnostic assistance required in modern patient care. Medical technologists also may be employed in research or work in a variety of industrial settings.

The medical technology curriculum is currently being revised for the Class of 1980-81. The freshman year is outlined below. Requirements for the sophomore, junior, and senior years will be available during fall, 1980, through the Medical Technology Program.

The major anticipated curriculum changes are as follows: 1) Students will spend one semester of study at area hospitals during the junior year. 2) The senior year will be spent on the Durham campus and students will take advanced courses in the sciences as well as additional electives. 3) Students will be awarded a B.S. degree following completion of the academic requirements at the end of the senior year. 4) To be eligible for professional certification in medical technology, an advanced clinical experience at Mary Hitchcock Memorial Hospital will be required. It is anticipated that this advanced affiliation will necessitate an additional five to nine months of study.

Academic requirements are as follows: Students must obtain a grade of C (2.00) or better in Micr 503, 702, 705; Chem 517-518, 545-546; Bchm 656; and all required MedT courses. Also, students must, by the end of the spring semester, sophomore year, demonstrate an overall cumulative grade-point average of 2.50 as well as a 2.50 grade-point average in the required chemistry and microbiology courses. Acceptance into the clinical affliliation is based upon evaluation of students' academic performance and personal interviews conducted by the UNH faculty. Students must demonstrate leadership and supervisory capabilities, the potential to assume responsibility, the ability to make sound judgments, and the capability to function effectively in a professional setting.

Students interested in this program should consult with the chairperson, Assistant Professor Karol LaCroix.

Freshman Year		Fall	Spring
Engl 401	Freshman English	4	—
Zool 507-508	Human Anatomy and Physiology	4	4
Chem 403-404	General Chemistry	4	4
MedT 401	Introduction to Medical Technology	—	0
Electives (3)		4	8
		16	16

Career Mobility Option This option is designed to make the B.S. degree in medical technology available to certified laboratory assistants, medical laboratory technicians, military trained laboratory personnel, and other individuals with at least two years of full-time recent experience in the clinical laboratory. This may be done on a full- or part-time basis by taking prerequisite courses at UNH or other accredited institutions throughout the state. Students have the opportunity to challenge clinical course requirements through credit by examination. A series of written and practical examinations are available in the areas of chemistry, hematology, urinalysis, microbiology, immunohematology, and immunology. Students interested in the option should contact the chairperson of the Medical Technology Program.

62

Nursing

The baccalaureate program aims to develop the student as a skilled practitioner of nursing with abilities to assist individuals or groups in promoting health needs, preventing illness, and caring for the sick. The student functions from a background of knowledge in the liberal arts and humanities and in the sciences basic to nursing, as well as in nursing itself. The objectives are to help the student gain necessary knowledge and skills to practice nursing in a variety of health care facilities, to foster accountability and commitment in the student, and to help individuals maximize their level of health.

The graduate is able to begin the practice of nursing and therefore can: 1) assess the needs of an individual for nursing care, 2) develop, implement, and evaluate a plan of care, 3) provide care from a framework of behavioral and natural sciences, 4) function as an advocate for clients, and 5) work as a collaborative member of a health team. A student who completes the requirements for the Bachelor of Science degree is eligible to take the state board examination and has the background required to pursue graduate study. The program is accredited by the National League for Nursing.

Hospitals and many community health-related agencies are used for learning experiences. Students are responsible for their own transportation to the clinical laboratories as well as for purchase of uniforms to be worn there. A physical examination and selected immunizations, at student expense, are required within the six months before the first clinical nursing course.

All students are required to achieve a minimum of C (2.00) in each prerequisite course and to maintain a cumulative grade-point average of 2.50 by the end of sophomore year. Students must earn a grade of C or better in each nursing course with a cumulative grade-point average of 2.50 in nursing by the end of junior year and throughout the senior year.

Expanding Baccalaureate Opportunities for Registered Nurses: EBORN

RN students who hold a current license to practice as registered nurses both in the state where employed and in the state of New Hampshire are admitted to the baccalaureate program. The baccalaureate degree for RNs is designed as an outreach part-time program which permits an individualized learning pace and continuation of present work and/or family responsibilities. The program titled EBORN (Expanding Baccalaureate Opportunities for RNs) does not include blanket endorsement of all previous education; however, advanced standing and course credit in the B.S. program may be earned. The length of the program depends upon an individual's past educational experiences, interest and ability to achieve, and advanced placement. The nursing courses are offered and sequenced to accommodate the individual learning pace. Nursing courses are designed as variable credit to enable the registered nurse adult learner (EBORN student) to challenge portion/s of a course with the permission of the faculty member or department.

Students interested in this program should consult with the chairperson, Associate Professor Andrea R. Lindell.

Freshman Year		Fall	Spring
Engl 401	Freshman English	4	—
Bchm 501	Biological Chemistry	4	—
Psyc 401	Introduction to Psychology	4	—
Nurs 402	Nursing	—	2
SHS 400	Health-Human Values	—	4
Soc 400	Introductory Sociology	—	4
Elective (3)		4	6-8
		16	16–18
Sophomore Year			
Zool 507-508	Hum. Anatomy and Physiology	4	4
Micr 501	Public Health Microbiology	3	—
Micr 502	Public Health Microbiology Laboratory	1	—
ThCo 402	Communication 1	4	—
HEc 525	Human Development	—	4
HEc 575	Normal and Therapeutic Nutrition	4	—
Statistics	(See department for course)	4	—
Elective		4	—
		16	16
Junior Year			
Nurs 601	Nursing Process	6	—
Nurs 603	Nursing Process (Well Family)	6	—
Nurs 610	Nursing Process (Environmental Influences)	—	6
Nurs 612	Nursing Process (Limited Disruptions)	—	6
Electives (2)		4	4
		16	16
Senior Year			
Nurs 621	Nursing Process (Complex Disruptions)	6	—
Nurs 625	Nursing Process (Complex Environmental Influences)	6	—
Nurs 628	Nursing Process (Optimal Function)	—	6
Nurs 630	Leadership Through Nursing Research	—	2
Electives (3)		4	8
		16	16

Occupational Therapy

The curriculum is accredited by the Committee on Allied Health Education and Accreditation in cooperation with the Accreditation Committee of the American Occupational Therapy Association. Two years of liberal arts courses and two years of professional study constitute the prescribed program leading to the Bachelor of Science degree. The program includes five major areas: the basic human sciences, the human development process, the health-illness-health continuum, specific life tasks and activities, and occupational therapy theory and practice. The curriculum reflects a model of holistic health. Occupational therapy is concerned with the individual's independent function and adaptation within his or her environment. Observation and guided practice of patient treatment in local clinical situations are an integral part of several courses.

Following completion of the four-year academic program, students are placed in three, three-month full-time fieldwork experiences. Completion of these three placements qualifies students to sit for the national certification examination of the American Occupational Therapy Association.

To continue in the major, students must meet the following criteria:

1. By the end of spring semester, freshman year, the student must have a 2.33 cumulative grade-point average in Engl 401, Psyc 401, and Psyc 581.
2. By the end of fall semester, sophomore year, the student must have a minimum of C (2.00) in O T 510 and Zool 507.
3. By the end of spring semester, sophomore year, the student must have:
   a) a 2.33 cumulative grade-point average in courses required for the major;
   b) a minimum grade of C (2.00) in O T 512, Zool 508, and Psyc 561;
   c) completed one O T 588-Level I Fieldwork experience.
4. By the end of spring semester, junior year, the student must have a 2.33 cumulative grade-point average in courses required for the major and have completed two O T 588-Level I Fieldwork experiences.
5. To qualify for graduation, the student must have:
   a) a 2.33 cumulative grade-point average in courses required for the major;
   b) a minimum grade of C (2.00) in PhEd 606, 652; O T 515, 581, 582, 583, 624, 633 and 634;
   c) successful completion of O T 588.

Courses required for the major are those specified in the following list with the exception of electives. Curriculum review and revision is undertaken annually; students are expected to check with their departmental advisers in September for updated policies and requirements. Students are responsible for transportation to off-campus clinical and other learning experiences and must purchase personal liability insurance for coverage for the clinical components of the curriculum.

Freshman Year		Fall	Spring
Engl 401	Freshman English	4	—
Psyc 401	Introductory Psychology	4	—
Psyc 581	The Study of Child Behavior	—	4
Electives (5)		8	12
		16	16

Sophomore Year			
Soc 500	Social Psychology	4	—
Zool 507-508	Human Anatomy & Physiology	4	4
O T 510	Occupational Therapy Theory	—	4
O T 512	Treatment Media Analysis I	—	2
O T 531	Group Process	2	—
O T 600	Developmental Tasks of Adulthood	4	—
Psych 561	Clinical Approaches to Human Behavior	—	4
Elective		2	2
		16	16

Junior Year			
O T 515	Treatment Media Analysis II	4	—
O T 581	Medical Concepts for Occupational Therapist	4	—
PhEd 652	Kinesiology	4	—
O T 582	Rehabilitation Techniques	—	4
O T 583	Occupational Therapy Psychiatric Foundations	—	4
PhEd 606	Neurology	—	4
Electives (2)		4	4
		16	16

Senior Year			
O T 588	Level I Fieldwork	—	1
O T 624	Occupational Therapy Treatment of Psychosocial Dysfunction	4	—
O T 633	Occupational Therapy Treatment for Physical Disabilities	4	—
O T 634	Level I Physical Disabilities Practicum	—	4
O T 636	Evaluation Techniques for Occupational Therapy	—	2
O T 691	Senior Project - Design	—	1
O T 692	Senior Project - Implementation	1	—
O T 697	Organization and Administration	2	—
O T 698	Senior Seminar	—	1
Electivea	(G.E.R.)	5	7
		16	16

Clinical Fieldwork Experiences	
O T 711 or	Psychosocial Dysfunction
O T 712	Physical Dysfunction
O T 713	Special Area

Upon completion of the prerequisite courses, students are scheduled for a minimum of nine months' supervised clinical fieldwork placements. These Level II Fieldwork experiences are scheduled in centers that have established educational programs and are approved by the department. The fieldwork experiences are divided into three-month periods as follows: O T 711, Psychosocial Dysfunction; O T 712, Physical Dysfunction; O T 713, Special Area. A physical examination including a tuberculin test is required before fieldwork experiences. Proof of poliomyelitis immunization is also required. Students pay a Level II Fieldwork fee ($400 as of May 1979; this fee will be increased in 1980).

Eligible graduates make application for the June or January national certification examination through the department. A $75 fee is charged by the American Occupational Therapy Association for this examination.

Curriculum revisions are being considered; information will be available during new-student summer orientation and during the first week of classes.

Students interested in this program should consult the chairperson, Associate Professor Barbara Sussenberger.

64

Physical Education

The department oF Physical Education offers five areas of study for majors: 1) teacher certification option; 2) athletic training option; 3) exercise specialist in health maintenance option; 4) pre-physical theraphy option; and 5) sports communication option. Openings in options 3, 4, and 5 are limited, and option 4 is not open to entering freshmen.

The teacher certification option provides a specialized professional background and a broad general education. Students may pursue coursework to prepare as generalists (all grade levels), or as either elementary or secondary specialists in physical education. In addition to the above, students enrolled in the teacher certification option in physical education may elect to pursue an athletic training option. A cumulative grade-point average of 2.20 and a grade-point average of 2.50 in all physical education courses are required to be eligible for student teaching.

Students must complete the following coursework before student teaching: 1) all required major activity courses, 2) either PhEd 563 or PhEd 692, 3) three of the following: PhEd 620, 625, 668, 775.

Students must earn a grade of C (2.00) or better in each of the required physical education courses if majoring in any one of the following options: 1) exercise specialist in health maintenance, 2) pre-physical therapy, 3) sports communication.

Students who wish to minor in physical education must complete 20 credits of coursework which have been approved by a department minor adviser. No more than 6 of the 20 credits may be earned through activity or coaching courses.

Students interested in majoring or minoring in physical education should consult the chairperson, Associate Professor Phyllis Hoff.

Teacher Certification Option

Required Physical Education Courses		Credits
PhEd 470-479	Physical Education Activities (for men and women)	7
and one of the following: PhEd 447, 449, 520, 527, 533, 534		1
PhEd 480-483, 485	Physical Education Activities (for men)	2.5
PhEd 484, 486-491	Physical Education Activities (for women)	3.5
One from the following: PhEd 410, 415, 416, 427, 428, 435, 437, 438, 439, 449, 453, 533, 534		.5/1.0
One course from the following: PhEd 411, 412, 414, 417, 419, 420, 421, 422, 423, 424		.5
PhEd 500	Perspectives in Physical Education	4
PhEd 501	Advanced First Aid and Emergency Care	2
PhEd 610	Adapted Physical Education	4
PhEd 620	Physiology of Exercise	4
PhEd 668	Measurement Procedures in Physical Education	4
PhEd 775	Perceptual Motor Learning	4
One of the following:		
PhEd 563	The Theory of Teaching Physical Education in the Secondary School	4
PhEd 692	Theories of Teaching Physical Education in the Elementary School	4
One of the following:		
PhEd 625	Dynamics of Human Movement	4
PhEd 652	Kinesiology	4
Education Courses		
Educ 500	Exploring Teaching	4
Educ 700	Educational Structure and Change	4
Educ 701	Human Learning and Development	4
Educ 705	Alternative Perspectives on the Nature of Education	4
Educ 694	Supervised Teaching of Physical Education	8
University Required Courses		
Psyc 401	Introduction to Psychology	4
Zool 507-508	Human Anatomy and Physiology	8

Athletic Training Option This option has limited enrollment capacity and is open only to students enrolled in the physical education teacher certification curriculum. Application for admission to the option is made through the department chairperson following completion of PhEd 502. Completion of all program requirements normally requires four and one-half to five years of study. In addition to the teacher certification curriculum requirements, students admitted to the athletic training option must complete HEc 573, Human Nutrition; SHS 400, Health-Human Values; O T 581, Medical Concepts for Occupational Therapists; and the following required courses:

Physical Education Courses		
PhEd 502	Basic Athletic Training	4
PhEd 606	Neurology	4
PhEd 652	Kinesiology	4
PhEd 702	Advanced Athletic Training	4
PhEd 703	Laboratory Practice in Athletic Training	8
PhEd 780	Psychological Factors in Sport	4

Exercise Specialist in Health Maintenance Option This curriculum prepares individuals for career opportunities in adult fitness programs in communities, industry, and health agencies. Exercise specialists work in physical activity programs of prevention, intervention, and cardiac rehabilitation. Students must complete all required physical education courses prior to enrolling in PhEd 650. Required courses are:

Physical Education Courses		
PhEd activities	(must include 475 and one of the following: 447, 520, or 527)	6
PhEd 501	Advanced First Aid and Emergency Care	2
PhEd 502	Basic Athletic Training	4
PhEd 620	Physiology of Exercise	4
PhEd 621	Exercise Laboratory Techniques	3
PhEd 622	Therapeutic Exercise and Exercise Prescription	3
PhEd 650	Exercise Specialist Internship	8
PhEd 652	Kinesiology	4
PhEd 668	Measurement Procedures in Physical Education	4

University Required Courses		
AnSc 506/ HEc 506	Principles of Nutrition	4
Bchm 501	Biological Chemistry	4
Psyc 401	Introduction to Psychology	4
Psyc 561	Clinical Approaches to Human Behavoir	4
Zool 507-508	Human Anatomy and Physiology	8

Pre-Physical Therapy Option The pre-physical therapy curriculum provides the necessary courses for meeting admission requirements to a physical therapy certificate program. However, satisfactory completion of all UNH degree requirements does not guarantee admission to one of the several physical therapy schools. In addition to the required courses listed below, work experience in a rehabilitation setting is highly recommended.

Physical Education Courses		
PhEd major activities	(must include 470, 472, and either 520 or 527)	6
PhEd 502	Basic Athletic Training	4
PhEd 606	Neurology	4
PhEd 620	Physiology of Exercise	4
PhEd 622	Therapeutic Exercise and Exercise Prescription	3
PhEd 652	Kinesiology	4
PhEd 775	Perceptual Motor Learning	4
One of the following:		
PhEd 675	Motor Development of the Young Child	4
PhEd 740	Perceptual Motor Dysfunction	4

University Required Courses		
Chem 403-404	General Chemistry	8
Phys 403-404	Introductory Physics for Biologists	8
Psyc 401	Introduction to Psychology	4
Soc 500	Social Psychology	4
Zool 507-508	Human Anatomy and Physiology	8
One of the following:		
Psyc 531	Psychobiology	4
Psyc 561	Clinical Approaches to Human Behavior	4
Psyc 711	Sensation and Perception	4
One of the following:		
HEc 525	Human Development	4
Psyc 581	The Study of Child Behavior	4
One of the following:		
Inco 650	Introductory Statistics	4
INER 528	Applied Statistics 1	4
INER 701	Statistical Methods 1	4
Psyc 601	Statistics and Methodology in Psychology	4
Soc 602	Statistics	4

Sports Communication Option The sports communication option combines substantive knowledge in sport with skills in mass communication, including sportswriting and sportscasting. A grade of B– or better is required in Engl 501 to continue this option. Most students in the sports communication option also participate in the English Department journalism program. For these students, an excellent record of performance in the writing courses is required. An internship experience is recommended for highly qualified students. Required courses are as follows:

Physical Education Courses		
PhEd activities		6
PhEd coaching courses		6
PhEd 633	Social Foundations of Sport and Physical Activity	4
PhEd 635	Sport in Literature	4
PhEd 668	Measurement Procedures in Physical Education	4
PhEd 780	Psychological Factors in Sport	4
PhEd 791	History of Physical Education	4

University Required Courses		
Engl 501	Introduction to Prose Writing	4
Engl 621	Newswriting	4
Psyc 401	Introduction to Psychology	4
Soc 400	Introductory Sociology	4
ThCo 402	Communication I	4
ThCo 403	Public Speaking	4
One of the following groups of courses:		
Engl 622	Newswriting	4
Engl 703	Advanced Nonfiction Writing	4
ThCo	Elective (a communication course)	4
ThCo 555	Introduction to Mass Communication	4
ThCo 556	Introduction to Television Production	4
Engl	Elective (a writing course)	4

Recreation and Parks

The undergraduate program in recreation and parks offers training for service in recreation administration and in park management. The courses of study in each area provide a base in the fundamentals of professional specialization and an exposure to the current leisure trends and needs of a rapidly changing economy and society.

Professional Curriculum Options

Professional options are offered in recreation administration and in park management, leading to a Bachelor of Science degree. Students must earn a grade of C (2.00) or better in each of the required recreation and parks courses.

Curriculum revisions are being considered in each of the professional options. Students will be informed of approved changes before enrollment in the program. For a more complete description of courses, contact the recreation and parks office.

Recreation Administration This specialization is designed to identify and develop the abilities which will prepare students for administrative and programming supervisory positions in the recreation fields. Students selecting this option are required to complete 128 credit hours for the degree.

Freshman Year		Fall	Spring
Polt 402	American Politics and Culture	—	4
Biol 402	Man and His Environment	—	4
REco 411	Introduction to Resource Economics	4	—
RecP 455	Introduction to Recreation and Park Services	4	—
RecP 454	Special Facility Operations	—	4
Electives (3)	General Education Requirements	8	4
		16	16
Sophomore Year			
Polt 503	Local Government and Politics	—	4
Polt 502	State Government and Federalism	—	4
REco 507	Introduction to Community and Community Development	4	—
RecP 457	Dynamics of Leadership and Programming	4	—
Electives (4)	General Education Requirements	8	8
		16	16
Summer			
RecP 564	Field Work	8	—

Junior Year			
Polt 500	American Public Policy	4	—
Admn 517	Survey of Basic Accounting	4	—
Admn 411	Behavior in Organizations	—	4
RecP 663	Recreation and Park Administration	4	—
RecP 667	Recreation and Resource Planning	—	4
RecP Elective (1)	Recreation and Parks	4	—
Electives (2)	General Education Requirements	—	8
		16	16

Senior Year			
Polt 702	Public Planning and Budgeting	4	—
RecP 771	Legal Aspects	—	4
RecP 798	Seminar in Leisure	—	4
RecP 772	Financial Administration	—	4
Electives (2)	General Education Requirements	8	—
		12	12

Park Management This specialization is concerned with economics, planning, and supervision, including the identification, acquisition and allocation, development, and maintenance of land and water resources for recreational purposes. Students selecting this option must complete 128 credit hours for the degree.

Freshman Year		Fall	Spring
Hydr 504	Freshwater Resources	—	4
RecP 455	Introduction to Recreation and Park Services	4	—
REco 411	Introduction to Resource Economics	4	—
RecP 454	Special Facility Operations	—	4
Bot 411	General Botany	4	—
Electives (3)	General Education Requirements	4	8
		16	16

Sophomore Year			
PlSc 522	Environment and Plant Response	—	4
REco 507	Introduction to Community and Community Development	4	—
RecP 661	Recreation Resources Management	4	—
RecP Elective (1)	Recreation and Parks	—	4
Electives (4)	General Education Requirements	8	8
		16	16

Summer			
RecP 564	Field Work	—	8

Junior Year			
Admn 517	Survey of Basic Accounting	—	4
RecP 663	Recreation and Park Administration	4	—
RecP 667	Recreation and Resource Planning	—	4
RecP 668	Designing and Engineering	4	—
REco 606	Land Economics and Use	—	4
RecP Elective (1)		—	4
Electives(2)	General Education Requirements	8	—
		16	16

Senior Year			
INER 797	Forest Recreation Seminar	4	—
INER 702	Natural Resources Policy	—	4
RecP 771	Legal Aspects	—	4
RecP 798	Seminar in Leisure	—	4
Electives (2)	General Education Requirements	8	—
		12	12

Leisure and Recreation Study in Scotland A sixteen-week program sponsored by the American Universities International Program is held each year during the spring semester at the University of Edinburgh, Scotland. Registration is limited. One year prior to departure, curriculum director approval in required. Sixteen credits are granted.

Whittemore School of Business and Economics

67

Charles B. Warden, Jr., Dean
Dwight R. Ladd, Associate Dean
John Korbel, Chairman, Student Affairs
Wayne M. Burton, Assistant to the Dean
John R. Haskell, Jr., Director of Center for Industrial and Institutional Development
Lois Grossman, Undergraduate Counselor

Programs of Study

Bachelor of Arts
Economics

Bachelor of Science
Administration
Hotel Administration

Purposes and Programs

The Whittemore School of Business and Economics was established July 1, 1962, as the result of the efforts of the late Laurence F. Whittemore, noted industrialist and long-time trustee and chairman (1955-60) of the UNH Board of Trustees. Since 1969, the school has been housed in McConnell Hall, named for Dr. John W. McConnell, the fourteenth president of the University (1963-1971).

The basic purpose of the undergraduate curricula in the Whittemore School is to combine the breadth of liberal education with the specifics of professional training in administration, economics, and hotel administration. Undergraduates enrolled in the Whittemore School programs must take a substantial part of their coursework in other colleges in the University in order to fulfill the General Education Requirements. Beyond those requirements, students are encouraged to elect additional courses in the arts, the behavioral and social sciences, the humanities, mathematics, and the natural sciences. Thus, students who complete the Whittemore School programs in administration, economics, and hotel administration are prepared for employment and graduate study in these and related fields.

Within the limits of its resources, the Whittemore School also intends to serve the needs of undergraduates elsewhere in the University for whom selected courses in administration, economics, or hotel administration are relevant and desirable complements to their primary course of study. To the extent the space is available after majors have enrolled, many Whittemore School courses, therefore, are open to nonmajors who have the prerequisite preparation.

Degree Requirements

The Whittemore School offers a Bachelor of Arts degree program in economics and Bachelor of Science degree programs in administration and hotel administration. Candidates for a degree must satisfy all of the University General Education Requirements for graduation as well as the particular requirements of the individual major program. Economics majors must also satisfy specific requirements associated with the Bachelor of Arts degree. (See page 15.) No Whittemore School course may be taken on a pass/fail basis by a student majoring in administration, economics, or hotel administration.

The curricula of the Whittemore School undergo timely revision and modification, and students are subject to and responsible for such changes as they are introduced. However, entering students may anticipate that a curriculum, as represented and as subsequently altered, can be completed in four academic years, assuming normal course loads are carried and normal progress is made. In sum, then, Whittemore School students generally follow the current catalog. New catalogs become effective on July 1 of each year.

For information concerning advanced degrees, see the Graduate School catalog.

Advising System

Undergraduate advising in the Whittemore School is carried out jointly by an undergraduate counselor and the faculty. The undergraduate counselor is based in the dean's office, where student academic records are kept. The counselor assists students in program planning, preregistration, understanding and meeting academic requirements, and general academic and career decision making. The faculty draw on their experience, expertise, and interests to help students with course, program, and career selection.

Students are not officially assigned to faculty advisers, but are provided with a Whittemore School *Faculty Profiles* booklet, which contains considerable information about faculty members' education, experience, and current teaching and research interests. Undergraduates are encouraged to develop an advisory relationship with one or more faculty members on the basis of mutual interests. Students who prefer a more formally structured arrangement are urged to so inform the undergraduate counselor, and such an arrangement will be made with either the associate or assistant dean. All students are urged to seek as much assistance as they need, from whatever source, but are reminded that theirs is the ultimate responsibility for knowing and meeting the various academic requirements for a degree.

Independent Study/Internship

Juniors or seniors in the Whittemore School may elect the internship or independent study options for variable credit. For either option, the student must secure a faculty sponsor in the area of interest and submit a proposal prior to the semester in which the project is to be undertaken. Independent study normally involves research, while internships are usually undertaken with cooperation of an off-campus organization and involve the nonroutine, but practical application of skills and concepts acquired in a student's program.

Independent studies and internships require considerable self-direction and self-monitoring on the part of the student, and careful prior review of requirements with the undergraduate adviser is necessary.

Five-Year Programs; B.A.-M.B.A., B.S.-M.B.A.

The Whittemore School and the College of Engineering and Physical Sciences offer a joint program leading to a Bachelor of Science (B.S.) in chemical engineering, civil engineering, electrical engineering, or mechanical engineering and a Master of Business Administration (M.B.A.) in five years rather than the normal six. Similarly, with the College of Liberal Arts, the Whittemore School offers a joint program leading to a B.A. in French, history, philosophy, or psychology and an M.B.A. The College of Life Sciences and Agriculture and the Whittemore School offer a joint program leading to a B.S. in Plant Science and an M.B.A. See the individual college descriptions for details.

Programs of Study

Administration Program

The Administration Program provides training for young men and women interested in managerial or administrative careers in business or in public or private institutions.

Since most graduates of the program elect to embark upon business careers, the major thrust is in that direction. However, as demand has grown in recent years for people able to apply businesslike methods to the problems of nonprofit institutions, such as hospitals, school systems, government departments, and other socially oriented organizations, the program's objectives have been broadened considerably to include all types of administration, rather than business only.

The curriculum offers professional education in the basic theories, principles, concepts, and analytical tools used by successful modern administrators, combining them with an introduction to some of the important functional areas of management. At the same time, typical students achieve a well-rounded education by selecting courses in the liberal arts and the sciences from other colleges and schools in the University.

The Administration Program consists of nine required courses in three groupings. Group A includes the five core courses taken in the freshman and sophomore years. These focus on basic concepts, tools, and skills. Group B consists of three courses in the functional areas of production, marketing, and finance, normally taken in the junior and senior years. Group C includes the final capstone course in administration, taken in the senior year.

Students must achieve a minimum grade-point average of 2.00 in Group A courses before any Group B courses may be taken. In order to graduate, students must achieve a grade-point average of at least 2.00 in the nine major courses. Transfer students must complete five courses in the program at UNH in order to qualify as majors. Credit toward the administration major is not normally given for Group B or C courses taken at the first or second-year level elsewhere.

Students are encouraged to take advanced electives in areas of their interest and in relation to career goals. Faculty members and the undergraduate counselor can provide useful information and guidance for choices of electives.

The Whittemore School also offers courses for nonmajors. Students interested in these courses should contact the Advising Office.

The required plan of study is given below:

Freshman and Sophomore Years (Group A)

Econ 401, Principles of Economics (Macro); Econ 402, Principles of Economics (Micro); Admn 411, Behavior in Organizations; Admn 424, Quantitative Analysis; Admn 502, Financial Accounting

Junior and Senior Years (Group B)

Admn 650, Operations Management; Admn 651, Marketing; Admn 653, Financial Management

Senior Year (Group C)

Admn 700, Business Policy

Economics

Economics is the study of the allocation of scarce resources among competing uses, either through use of conscious public policy ("planning") or through impersonal market forces. The analytical skills of economists are useful in evaluating alternative methods of achieving these goals and in the formulation of new approaches to problems in these areas.

The economics program is designed to introduce students to the tools of economic analysis and to an understanding of the areas to which they may be usefully applied.

While undergraduate training in economics does not qualify students as professional economists (those intending such a career should plan on graduate study), it is regarded by employers as a highly desirable background for business or governmental employment. In recent years, economics graduates have competed on a favorable basis for business and government jobs with graduates in other areas, including administration. Undergraduate economics training is an excellent background for graduate work in law, business administration, and international relations, as well as economics.

Students planning to pursue graduate study in economics should consult with their advisers or faculty members early in the academic program to assist in their selection of an appropriate graduate school and to aid in gaining admission.

Courses in economics, including a minor program, are open to nonmajors. Students majoring in other programs may find certain economics courses useful supplements to their own majors and an aid in future employment. Political science majors may be interested in courses in economic development, comparative economic systems, public finance, and government regulation of business; engineering and science students may be interested in courses in introduction to econometrics, and intermediate microeconomic analysis. Noneconomics majors with questions about the nature of various courses should feel free to question the economics faculty.

Economics majors must complete eight full courses in economics with a grade of at least C− (1.67) in each course and achieve at least a 2.00 grade-point average. These must include both intermediate theory courses, Econ 605 and 611. Students must also pass Econ 525, Introduction to Economic Statistics, or equivalent as determined by the economics faculty. (Students may petition to substitute one 600- or higher-level administration or resource economics course for an economics elective.) Major credit toward Econ 605 and/or 611 will be awarded transfer students only if such courses have been taken at the junior level or above. Transfer students must take five of their eight economics courses at UNH. All economics majors must satisfy the Bachelor of Arts degree requirements (page 15).

A suggested plan for economics majors is given below:

Freshman and Sophomore Years

Econ 401, 402, Principles of Economics (Macro and Micro); Econ 525, Introduction to Economic Statistics

Junior Year

Econ 605, Intermediate Microeconomic Analysis; Econ 611, Intermediate Macroeconomic Analysis

Senior Year

Economics electives (3)

Minor A minor in economics consists of Econ 401, 402; Econ 605 or 611 or 635; and two economics electives.

Hotel Administration

The Hotel Administration Program objective is to prepare students to perform managerial-level jobs in enterprises and institutions of the service sector, which have lodging and/or food service components. The service sector includes lodging, food service, tourism, and recreation industries, and institutions such as hospitals and schools.

The program design recognizes that in order to have a well-rounded University education, students need a course foundation in business administration and economics as well as the liberal arts. The hotel administration courses build upon such a foundation and provide experience and in-depth education specifically in the lodging and food service industries.

The program is also designed to include a mix of practical experience along with classroom activities. These practical experiences are provided in the operation of a campus food service facility, catering services, gourmet dinners and major consulting projects to industry (as part of classroom projects), lecture series, seminars and field trips, and a required summer of related work experience.

The Hotel Administration Program consists of 12 required courses in three groupings. Group A consists of six core courses taken in the freshman and sophomore years. Group B includes most of the functional areas needed for developing successful management skills. These are generally taken in the sophomore and junior years. Group C includes Hotl 700, taken in the senior year.

Students must achieve a minimum grade point average of at least 2.00 in Group A courses before Group B courses may be taken. The same relationship applies between Group B and Group C courses.

Students in the Hotel Administration Program must obtain a grade-point average of 2.00 or better in the required courses given in the Whittemore School. Graduates of this program who are qualified for and interested in further allied studies are well prepared for advanced degree programs in business or institutional administration.

A suggested plan of study is given below.

Freshman and Sophomore Years (Group A)

Hotl 403, Elements of Institutional Administration; Admn 411, Behavior in Organizations; Econ 401, Principles of Economics (Macro); Econ 402, Principles of Economics (Micro); Admn 424, Quantitative Analysis; Admn 502, Financial Accounting

Sophomore and Junior Years (Group B)

Hotl 618, Financial Analysis and Control; Hotl 556, Management of Physical Structures; Admn 651, Marketing; Hotl 655, Management for Transient, Leisure, and Institutional Services; Hotl 667, Functional Management

Senior Year (Group C)

Hotl 700, Markets and Promotion of Public Service

Secretarial Studies

The Whittemore School also offers courses in secretarial studies, including introductory and advanced typing and shorthand, for all students in the University.

Special University Programs

Preprofessional Programs

Prelaw

The Prelaw Committee of the University of New Hampshire recommends consideration of the following description of prelegal education excerpted from the *1979-1980 Prelaw Handbook* of the Association of American Law Schools (pp 14–16).

Law schools are vitally concerned with the quality of preparation that students bring from their undergraduate experiences. For unless that preparation has been of high quality, the law schools cannot equip them for satisfactory performance within the legal profession and the democratic community.

The Association's responsibility in matters of prelegal education cannot best be met by prescribing certain courses and extracurricular activities for students planning to study law. The wide range of a lawyer's tasks opens a correspondingly wide range for choice of relevant prelaw preparation. So-called "law" courses in undergraduate instruction should not be taken for the purpose of learning the "law." They are not likely to be effective as education for lawyers, although they can be very helpful for teaching students "about law" and quite possibly for helping students estimate whether they might be insterested in law study.

But while it considers the prescription of particular courses unwise, the Association can call attention to the quality of undergraduate instruction it believes fundamental to the later attainment of legal competence. That quality of education is concerned with the development in prelaw students of basic skills and insights. It thus involves education for:

Comprehension and Expression in Words Language is the lawyer's working tool. He or she must be able, in the drafting of legal instruments, to convey meaning clearly and effectively. In oral and written advocacy he or she must be capable of communicating ideas convincingly and concisely. In reception no less than in expression, language is fundamental as the lawyer's medium of communication. For the lawyer must be able to grasp the exact meaning of factual statements and legal instruments, to catch the fine points of legal reasoning and argument, and to comprehend the technical materials that constitute the body of the law. To acquire sufficient capacity for communication calls for extensive practice in all phases of the art. Truly, the law-trained man or woman must be a precisionist in the use of the English language.

Critical Understanding of Human Institutions and Values The purpose is to develop insight into, rather than merely information about, institutions and values: human nature and the physical world; the economic systems of societies; the democratic processes in western societies; the social structures of societies; the cultural heritage of western societies, including philosophy ethics.

Creative Power in Thinking The purpose is to develop a power to think clearly, carefully, and independently. A large part of the work law-trained people are called upon to do calls for problem solving and sound judgment. Creative power in thinking requires the development of skill in: research; fact-completeness; marshalling and differentiation of facts; deductive and inductive reasoning; reasoning by analogy; critical analysis; constructive synthesis; power of decision.

Students who hope to enter law school should contact a member of the University Prelaw Committee to discuss courses of study and other matters related to law school. This is particularly true for seniors intending to take the Law School Admission Test (LSAT) and to enter law school upon graduation. The members of the Prelaw Committee are: John R. Kayser, chairperson, Political Science; Richard V. Desrosiers, Ancient and Modern Languages and Literatures; Attorney Michael E. Jones, Whittemore School of Business and Economics; and William R. Jones, History.

72

Interdisciplinary Programs

Premedical-Predental Program

Students considering careers in medicine or dentistry should become familiar with the minimum course requirements as early as possible in order to incorporate them into their programs. The premedical-predental program is not a major with a rigidly prescribed curriculum; rather, it is the acknowledgment of student's professional intentions. Although a majority of students in the past have elected zoology as a major, there is a trend, particularly in premedicine, away from exclusive concentration in a single area of science. In recent years, students from UNH have chosen to major not only in sciences such as zoology, microbiology, biochemistry, and chemistry, but also in such fields as history, English, psychology, and political science.

Students are assigned an appropriate faculty adviser from that department or school of their chosen major. The responsibility of the Premedical-Predental Advisory Committee is to offer information about medical and dental admission requirements and procedures and to provide recommendations at the time of application.

All medical and dental schools expect applicants to have demonstrated ability in basic natural and physical sciences. Although the specific requirements for admission vary considerably, the following courses constitute a minimum in order for students to be considered for admission: biological sciences, physics, general chemistry, and organic chemistry, all two semesters each with laboratory; and mathematics through calculus. Proficiency in English and a foreign language is strongly recommended. An appropriate group of courses from among the offerings at the University of New Hampshire would be the following: Zool 412, 518; Phys 403-404 (or 407-408; Chem 403-404, 651-652, 653-654; and Math 425-426. One semester of biochemistry (Bchm 501 or 601) also is required by some dental schools.

Courses which qualify individuals for consideration as premedical or predental students should be completed by the time application to a professional school is submitted, usually by the end of the junior year. Inasmuch as performance in these courses is weighted heavily by the admissions committees, it is strongly recommended that students not register for them under the pass/fail grading alternative.

The following schedule is suggested for timing applications to medical and dental schools.

1. Students should apply to schools of their choice in the summer after their junior year if they wish acceptance following graduation. However, a delay of a year to complete courses or to work is neither detrimental nor unusual for acceptance into medical or dental school. Though the application services accept applications from June through December, early applications are often advantageous.
2. The MCAT and DAT exams are preferably taken in the spring of the student's junior year (if the student is applying as a senior). The Medical College Admissions Test (MCAT) or the Dental Admission Test (DAT) must be taken before or at the time of application to medical or dental schools.
3. Interested students should contact the Premedical/Predental Office to meet members of the Advisory Committee preceding their application to medical or dental schools, since the letter of recommendation provided by the committee is an integral part of the admission process.

Among students from UNH who were accepted into medical or dental schools, the competitive overall grade-point average is 3.6 for medical school and 3.3 for dental school. Interested students should contact the Premedical-Predental Advisory Committee office as soon as possible.

In addition to the general University interdisciplinary opportunities described in this section, other ways of combining studies are mentioned in the program information of the various colleges and schools. Some of the more specific opportunities are:

Biomedical systems and instrumentation minor, page 46;
Community development, page 39;
Dual degrees, page 15;
Environmental conservation, page 39;
Environmental engineering minor, page 46;
Five-year B.A.-M.B.A. program, page 21;
Five-year B.S.-M.B.A. program, page 36 and page 45;
Forest resources, page 40;
General studies, page 38;
History and philosophy of science minor, page 22;
Humanities major, page 27;
Hydrology, page 41;
Independent study and projects in the College of Engineering and Physical Sciences, page 47;
Interdisciplinary mathematics (8 options), page 55;
Interdisciplinary science—B.A., science major, chemistry concentration, page 49, earth sciences concentration, page 51, mathematics concentration, page 54, physics concentration, page 57;
Linquistics major, page 28;
Materials science minor, page 46;
Minors, page 16;
Ocean engineering minor, page 45;
Oceanography minor, page 46;
Religious studies minor, page 23;
Resource economics, page 41;
Second majors, page 16;
Soil science, page 42;
Student-designed majors, page 72;
Wildlife management, page 42;
Women's studies minor, page 23;

Student-Designed Majors

Under special circumstances, students may design their own majors. This option is offered for highly motivated and independently disciplined students who seek a course of study that is not available through exisiting programs at the University. It allows students, with the close supervision of faculty members, to cross department and college lines and to create

educational experiences on and off campus as part of individual programs of study.

Student-designed majors are administered by a committee of elected faculty that operates through the Office of the Vice President for Academic Affairs. Students who want to design their own majors are expected to give the committee evidence of careful thought and planning in a detailed proposal submitted before the middle of their junior year. Proposal guidelines are available in the Office of the Vice President for Academic Affairs.

Teaching-Learning Council

The Teaching-Learning Council, an extraordinary committee established by the Academic Senate, is charged with encouragement of excellence and innovation in undergraduate teaching. To this end, the council has established the Teaching Resource Center for the improvement of teaching.

In cooperation with the Teaching-Learning Committee in each of the University's colleges and schools, the council supports development of new approaches to teaching in existing or new courses, and promotes development of experimental and interdisciplinary courses and programs by faculty members and other qualified persons. Courses under council sponsorship are normally offered for one semester, though some have been repeated.

Intercollege Courses The Independent Work-Study courses and the modular Introductory Applied Statistics course are continuing offerings and are listed in the course descriptions, pages 131-132.

Interdepartmental Biology Major

The interdepartmental biology major is designed with a common core curriculum from which programs of study are available for: 1) preparation for teaching biology in secondary schools; and 2) preparation for professional careers in biology or graduate study. Completion of the four-year undergraduate program plus a fifth-year internship will be necessary for biology teacher certification.

Students are advised to declare the biology major as incoming freshmen to assure adequate program planning. The major is offered in both the College of Liberal Arts and the College of Life Sciences and Agriculture under the supervision of the Inter-College Biological Sciences Organization. Students who wish a less specialized program or who do not plan to teach secondary school should consider a major in animal sciences, biochemistry, botany, entomology, microbiology, plant science, or zoology.

Major and supporting courses in the following list should be taken in the sequence given. Students planning to teach should enroll in Educ 500 during their sophomore year and should consult with the Department of Education on further courses in that field. Those not planning to teach will instead take three advanced biological science or supporting courses. Graduation requirements include a 2.00 cumulative grade-point average in the courses prescribed in the major. A grade of C– (1.67) or better is required in 11 biological science courses. Students majoring in one of the biological science departments may not minor in biology. The biology major is not recommended for students planning to go to medical school.

Students interested in the biology major should contact Professor Avery E. Rich, if in the College of Life Sciences and Agriculture; Professor Frank K. Hoornbeek, if in the College of Liberal Arts; or Ms. Abigail R. Lamsden, Department of Zoology, if planning to teach.

Major Course Sequence Note: Except for science courses, University General Education Requirements are not included. (See General Education Requirements, page 13.)

Freshman Year

Bot 411 or 412, Zool 412, Chem 403-404, Math 425

Sophomore Year

Chem 545, Zool 518, Zool 527, Biol 541, Educ 500*, Bot 566

Junior Year

Phys 403-404, Bot or PlSc 606, Micro 503, education*, advanced biology, or supporting courses†

Senior Year

Ento 402, Zool or PlSc 604, a 700-level botany course, education*, advanced biology, or supporting courses†

*For teacher preparation, consult the Department of Education.

†For nonteacher preparation, substitution of Chem 651–652 for Chem 545 early in the program, and the second semester of calculus are suggested for graduate school preparation.

Genetics

An undergraduate degree in genetics is not offered at the University of New Hampshire. In the Graduate School, the M.S. and Ph.D. degrees are offered in an interdepartmental Genetics Program. For courses offered in the program, some of which may be taken by undergraduates, refer to the Graduate Catalog. Students interested in preparing for graduate work in genetics at UNH or elsewhere should contact the chairperson of the Genetics Program early in their undergraduate careers for advice on courses.

Marine Science

The University is centrally situated on the northern New England coast near a variety of estuarine, coastal, insular, and continental shelf marine environments. This ideal location has resulted in a long-standing history of educational and research activities which currently are being pursued within the areas of the marine life; the physical and social sciences; ocean engineering; and chemical, geological, and physical oceanography. Supporting facilities include the Marine Program Building, the Marine Systems Engineering Laboratory, the Diamond Island Ocean Engineering Station, the Mechanics Research Laboratory, the Jackson Estuarine Laboratory, the Visitor Interpretive Center at Odiornes Point State Park, the

74

Portsmouth Pier facility, the Shoals Marine Laboratory, departmental laboratories and shops, the 45-foot R/V *Jere A. Chase*, another 50-foot research vessel, and several smaller vessels. A SCUBA diving program also supports these activities.

Oceanography Students who wish to prepare for a career in oceanography should have a good foundation in the basic sciences. As a minimum, they should elect Chem 403-404, Math 425-426, and Phys 407-408. Students should enroll as a major in one of the established science disciplines closest to their principal area of interest. An adviser in the department will help students select additional courses. Those students interested in chemical, geological, or physical oceanography should consult with Professor Herbert Tischler, Department of Earth Sciences. Students with interests in the area of biological oceanography should contact Professor John E. Foret, Department of Zoology; Professor Arthur C. Mathieson, Department of Botany; or Professor Galen E. Jones, Department of Microbiology. Usually additional work at the graduate level is necessary in the field of oceanography.

In addition to the courses necessary to attain a degree in a specific discipline, students should, in consultation with their advisers, consider some of the following courses which are available to undergraduates: 1) Botany: 525, 721, 722, 723; 2) Earth Sciences: 501, 502, 734, 741, 752, 754, 758, 759; 3) Microbiology: 503, 600, 707, 708; 4) Zoology: 412, 528, 542, 604, 628, 674, 715, 724, 772, 775.

Students who plan on taking some of the above courses in addition to courses in their academic major should consider the minor in oceanography (see page 46).

Cooperative Educational Program in Marine Science A summer program emphasizing field marine science is offered in cooperation with Cornell University. A general introduction to marine science aimed primarily at undergraduates, the program draws on the backgrounds of more than 25 faculty and nearly as many captains, fishermen, and others whose living is associated with the sea. Prerequisite: at least one full year of college biology. Daily lectures and laboratory field work are conducted at the Shoals Marine Laboratory on Appledore Island at the Isles of Shoals. Grades are Cr or F (credit or fail). Two sections of a four-week course in Field Marine Science, Zool 674 (6 credits), are taught each summer. Between the sections of this course, advanced courses are offered in Invertebrate Embryology (three weeks, 3 credits), Field Phycology (three weeks, 4 credits), Anatomy and Behavior of the Gull (one week, 1 credit), Research in Biology (one to five weeks, 1 to 4 credits), Underwater Research (two weeks, 3 credits), Coastal and Oceanic Law and Policy (one week, 1 credit), Chemical Oceanography in the Field (three weeks, 3 credits), and Field Marine Science for Teachers (one week, 1 credit). For further information, contact the Marine Program Office, Marine Program Building, UNH, Durham, NH 03824.

Reserve Officers Training Corps Programs

The Army and Air Force offer Reserve Officers Training Corps (ROTC) programs leading to a commission as a second lieutenant in their respective services. Both programs are open to men and women. Students in either ROTC program may pursue any University curriculum that leads to a baccalaureate or higher degree.

Two- and four-year programs are available. The four-year program is open to freshmen and to transfer students who began ROTC at another institution. In addition to on-campus ROTC course requirements, students must attend an officer preparatory training session for a part of one summer.

Two-year ROTC programs are open to students who have two academic years of study remaining at the University. Applicants for the two-year program must attend a six-week training session during the summer immediately before their entry into ROTC.

ROTC scholarships are offered on a competitive basis by both the Army and Air Force. Entering freshmen may compete for four-year scholarships during the last year of high school. Students in a four-year ROTC program and two-year program applicants compete for scholarships covering their remaining academic years. Scholarships pay for full tuition, all mandatory University fees, and required textbooks for all courses. In addition, all scholarship recipients receive a tax-free $100-per-month subsistence allowance. Nonscholarship students in the last two years of an ROTC program also receive the tax-free $100-per-month subsistence allowance.

Students in Air Force ROTC are required to take a math reasoning course from a list approved by the Professor of Aerospace Studies as part of their curriculum. Students who are qualified for pilot training are provided civilian flight instruction.

More specific information about ROTC programs may be obtained by contacting the professor of military science (Army ROTC) or of aerospace studies (Air Force ROTC).

Off-Campus Programs

Consortium (NHCUC) Student Exchange Program

Under the Student Exchange Program of the New Hampshire College and University Council (NHCUC), UNH students may enroll for: one or two courses, one semester of courses, or a full year of coursework at a member school, on a space-available basis. Approval of the UNH adviser and college dean is required. Schools in the NHCUC consortium include: Colby-Sawyer College, Daniel Webster College, Franklin Pierce College, Nathaniel Hawthorne College, New England College and its Arundel Branch in England (limited enrollment), New Hampshire College, Notre Dame College, Rivier College, St. Anselm's College, UNH, Keene State College, and Plymouth State College. Students will remain as degree candidates and continue to pay normal UNH tuition and fees but must make their own room and board arrangements if they plan to spend a full semester at another Consortium school. For more information and application forms, students should contact George T. Abraham, coordinator for the Student Exchange Program, Liberal Arts Advising Center (Murkland Hall). Associate Professor F. William Forbes (Department of Ancient and Modern Languages and Literatures) is the University's member of the council's Cooperative Academic Programs Committee.

MVC/UNH Student Exchange Agreement

The purpose of the Merrimack Valley College (MVC)/UNH student exchange is to allow matriculated undergraduates at either institution to use educational resources which are not available at their home campus but which are available at the host campus and are considered appropriate for their degree programs. The expectation is that the student exchange will be used only when academic reasons or other special circumstances warrant it. UNH undergraduates interested in the student exchange must receive prior approval from George T. Abraham in the Liberal Arts Advising Center, Murkland Hall.

California Student Exchange Program

The University offers one-semester or full-year exchange programs with California State University at Chico and San Diego State University. Interested students should contact the Dean of Students Office, Huddleston Hall.

Foreign Study Programs

The University's Department of Ancient and Modern Languages and Literatures offers opportunities to study in France, Austria, and Spain. For more information, contact the Department of Ancient and Modern Languages and Literatures, Murkland Hall.

There are two University programs to England: through the Department of English, a student can attend a summer program at Cambridge and through the N.H. Consortium, a student can spend a semester or year at Arundel. For the summer program contact the English department. For the Arundel program contact George Abraham in the Advising Center, Murkland Hall.

It is also possible with prior approval to obtain credit from other institutions for foreign study programs. Interested students should contact George Abraham in the Advising Center, Murkland Hall.

Career Option Minors

Bachelor of Arts students may obtain a minor in the DCE career options. Bachelor of Science students may complete the appropriate sequence of courses for a concentration, but not a minor designation. Prior approval from students' advisers and college dean, as well as the DCE coordinator and director, is required. Since these programs are designed primarily for Associate in Arts students, bachelor's students may participate on a space-available basis.

Career options are offered in accounting, banking, criminal justice, insurance, library science, management, merchandising, quality control, real estate, and traffic and distribution management.

Associate in Arts in General Studies Degree

The Associate in Arts in General Studies degree gives students an opportunity to: obtain a general, two-year college education, elect career-training coursework in several fields, and earn college credits in supervised work experience with cooperating employers.

The Division of Continuing Education (DCE) designed the program to be equally accessible to both full- and part-time students and, in doing so, assured that a wide range of University credit courses would be available both during the late afternoon and early evening hours and during the daytime.

For full-time A.A. students, cooperative field work can mean alternating semesters of full-time study and full-time employment (with pay) in one of several careers. For part-time students who already hold full-time positions, it can mean an opportunity for new on-the-job experiences for college credit. Each field experience is arranged by a DCE coordinator on an individual basis, depending on student needs and the requirements of the employer.

The Associate in Arts degree can be complete in itself, or it can be a halfway mark toward a bachelor's degree. Credits earned as an A.A. degree candidate are transferable into related bachelor's degree programs at the University of New Hampshire and other colleges and universities.

Career Options

Within the Associate in Arts degree program, students may elect courses in one or more of the following concentrations:

Accounting Accounting is the second largest profession for men in the United States today, and in recent years many women have also taken advantage of the career opportunities in the field. Increasing government regulations—ranging from new tax laws to wage and price controls—require the expertise of a greater number of qualified accountants and auditors. This career option provides students with the degree of specialization required to qualify for responsible jobs in accounting and will aid them in pursuing a more advanced degree at a later time in their careers. Required accounting courses: DCE 462-463, 561, and 562.

Banking The career coursework in the banking option meets a need expressed by top-level banking management and associations for employees specifically trained in this field. Combined with the General Education Requirements of the A.A. degree program, these core courses give students the knowledge and skills that top management is continually seeking. Students can supplement money-and-banking courses with electives in management, business law, accounting, and economics to obtain a solid business background. Required banking courses: DCE 440, 441, 533, and 540.

Criminal Justice Careers in criminal justice are among the most challenging occupations for men and women today. Careers in criminal justice extend beyond the "police beat" and include, for example, positions in various agencies of law enforcement at the municipal, county, state, and federal levels of government, and in private industry. This career option is offered in cooperation with the Department of Criminal Justice at St. Anselm's College. Required criminal justice courses: DCE 550, 551, and 552, and a choice either of one from DCE 554, Polt 507, or Soc 615, or of two criminal justice courses from St. Anselm's College.

Insurance The core courses in the insurance option can assist students who wish to qualify for an agent's and/or broker's license. A.A. graduates who complete the insurance option may find a higher level of job entry and increased promotional opportunities with both large and small insurance firms. This career option may also be supplemented with electives in management to offer a solid educational background for individuals planning to start their own businesses. Required insurance courses: DCE 420, 421, and 422; and at least one from DCE 506, 531, or 532.

Library Science Through basic courses in library services, this program prepares paraprofessional librarians to support the professional librarian and to serve the public.

Employment opportunities for paraprofessional librarians exist in public school and college libraries, as well as in specialized libraries maintained by commercial and industrial firms, government agencies, and other organizations and institutions. Required library science courses: DCE 401, 402, and 403; and one from 501, 502, or 503.

Management Careers in management exist at many levels, and this career option is designed to assist students in gaining entry and promotional opportunities in the field. The career-training coursework emphasizes and develops the skills needed in management functions. Competent personnel at the assistant managerial level will continue to be needed for business, sales, purchasing, personnel, accounting, and public relations, to name a few. Individuals now planning or running their own businesses will also find the practical nature of this career option quite helpful. Required courses for the *small business management* emphasis: DCE 430; DCE 431 or Admn 411; and two from DCE 411, 432 (or 462), 532, or 534. Required courses for the *manufacturing management* emphasis: DCE 430; DCE 431 or Admn 411; and two from DCE 432 (or 462), 480, or 570. Required courses for the *general management* emphasis, recommended for students without business experience: DCE 430; DCE 431 or Admn 411; and two from DCE 432 (or 462), 530, or 532. Required courses for the *office administration* emphasis: DCE 430; DCE 431 or Admn 411; and eight credits from DCE 432 (or 462), DCE 535, Secr 401-402, or Secr 407-408.

Merchandising Careers in merchandising represent a significant segment of New Hampshire's economy, and many functions within the field require specific knowledge and skills. The career-training coursework in merchandising begins with the fundamentals and expands to specific techniques in promotion and advertising, retailing, and credit management. Employment opportunities exist not only in large industries but also in department stores, retail operations, discount stores, supermarkets, mail order operations, and smaller variety stores in the resort areas. Required merchandising courses: DCE 410, 411, 510, and either 512 or 533.

Quality Control Personnel working with quality control function in an environment of increasing complexity. Innovations in technology and organization cause frequent changes in their job requirements. Such innovations, when properly understood and applied, make individuals more effective in their work and help them guard against technical obsolescence. The quality control degree option consists of coursework in quality control and management combined with a strong program in liberal arts. Required quality control courses: DCE 480, 580, 581, and 582.

Real Estate The career training coursework in the real estate option can help students who wish to qualify for a state license. A.A. graduates who concentrate on the real estate option may often find a higher-level job entry and increased promotional opportunities with both large and small real estate firms. Supplemented with elective courses in management, this option can also offer a solid educational background for individuals planning to establish businesses. Required real estate courses: DCE 425, 426, 525, and 526.

Traffic and Distribution Management Rapidly rising costs and materials shortages have made product distribution one of the most complicated jobs in the business world today. The problems of energy conservation, cost consciousness, and operational efficiency have created a demand for managers who thoroughly understand the dynamics of physical distribution. This career option was developed to train prospective traffic and distribution managers and to improve the skills of those already employed in the field. Required traffic and distribution management courses: DCE 470, 570, 571, and 431.

Admission Requirements

For the Associate in Arts degree program, candidates must have a high school diploma or an equivalency certificate and should have demonstrated ability and motivation through secondary school achievement, work experience, and/or military service. Because of the present limited residence hall capacity of the University, this program is available only to commuting New Hampshire residents. The state-residency requirement may be waived for applicants who are full-time employees of a New Hampshire business.

Associate in Arts degree candidates are awarded a minimum of 64 credit hours upon entry into a UNH bachelor's degree program. Degree candidates wishing to continue their studies should consult with their advisers to assure that their planned programs meet the specific requirements for the selected major at the institution awarding the bachelor's degree.

Applications for admission may be obtained from the Office of Admissions, Thompson Hall. After being admitted to the A.A. degree program, candidates will be referred to a permanent adviser in the Office of Academic Advising, Division of Continuing Education.

Degree Requirements

For degree requirements, see page 15.

Academic Regulations

Associate in Arts degree candidates are subject to the academic requirements established by the University.

Pass/Fail Associate in Arts degree candidates, after completion of a minimum of 16 credits at the University of New Hampshire on a regular graded basis of A to F, may use the pass/fail grading alternative in a maximum of two elective four-credit courses. The pass-fail grading alternative may be used for a maximum of four credits per semester. No pass/fail grading alternative may be used in any of the group requirements, i.e., science-mathematics, arts-humanities, and social sciences. The pass/fail grading alternative may not be used for Engl 401 or for courses in students' declared career option. The minimum passing grade for credit is a D− (0.67). Any grade below this minimum will be considered as a fail.

Advising

Program planning and other advising services are provided by the professional staff of the Division of Continuing Education. Academic advisers are available from 8 a.m. to 5 p.m. daily and during evening hours on an appointment basis.

Financial Aid

Associate in Arts degree candidates are eligible for the full range of financial aid offered by the University. See the Financial Aid section of this catalog.

For More Information

For further information about programs or services, write or visit the Division of Continuing Education, Office of Academic Advising, Brook House, UNH, Durham, N.H. 03824 (603-862-1548).

Thompson School of Applied Science

Lewis Roberts, Jr., Director

The Thompson School of Applied Science (TSAS) offers two-year, technical-level programs leading to an Associate in Applied Science degree. A "learning-by-doing" educational approach trains graduates for employment as technicians, professional assistants, supervisors, and mid-management personnel in industry, organizations, and agencies.

Programs currently offered include: 1) Applied Animal Science, 2) Applied Business Management, 3) Applied Plant Science, 4) Civil Technology, 5) Food Services Management, and 6) Forest Technology.

Thompson School graduates acquire necessary skills and experience to seek satisfactory employment at the end of two years; they also have the option to continue their education at the baccalaureate level. Most colleges accept Thompson School graduates at the junior-year level. Others, including most UNH baccalaureate programs, accept Thompson School graduates as second-semester sophomores.

Thompson School students are eligible for on-campus housing.

Admission Requirements

Applicants to the Thompson School of Applied Science are considered on the basis of secondary school course selections, academic achievement, class rank, and school recommendations. The secondary school program need not be college preparatory. Rather, emphasis is placed on applicants' motivation and demonstrated interest in their career fields.

All candidates graduating from high school must submit the results of the College Entrance Examination Board Scholastic Aptitude Test. Applicants to the Forest and Civil Technology programs must also have two years of satisfactory work in college preparatory mathematics.

The mission of the Thompson School is to offer applied science degree programs in selected career fields. Students who seek to continue their education in the University's baccalaureate degree programs should realize that transfer consideration is based on applicants' level of achievement and on the availability of spaces in the baccalaureate programs. The University awards approximately 60 percent block transfer credit for TSAS coursework and does not guarantee transfer admission.

Four-hundred-plus numbered courses taken by a TSAS student will be incorporated into the cumulative grade-point average upon the student's matriculation in an Associate in Arts or bachelor's degree program. This policy became effective in September, 1979. It will apply whether or not the former TSAS student actually received the A.A.S. degree. Students may not petition to selectively include in or exclude from their Associate in Arts or bachelor's degree grade-point average any 400-plus numbered courses that were taken during the A.A.S. degree program. Interested students should check with their advisers concerning transfer.

In those cases where four-year and Thompson School courses are taught together, TSAS students may enroll in the four-year course if they present academic evidence that the course can be handled successfully, and if they have the written approval of both the TSAS adviser and the instructor of the four-year course. When enrollment in the four-year course is permitted, TSAS students must meet all of the requirements of that course, including regularly scheduled final examinations and attendance to the end of the University academic year.

For a Thompson School Catalog and/or more specific information, write or call the director, Thompson School of Applied Science, Barton Hall, Durham,, N.H. 03824 (603-862-1025).

Division of Continuing Education and Summer Session

Continuing Education

Edward J. Durnall, Director
Paul A. Dubois, Associate Director
Merna E. Johnson, Assistant Director: Academic Advisement

The Division of Continuing Education (DCE) provides access to higher education for New Hampshire residents under conditions that permit individuals to participate in University programs appropriate to their changing educational needs. These needs may at times be best satisfied through participation in workshops, seminars, short courses, or certificate programs—at other times by enrollment in credit courses and degree programs.

The faculty of the Division of Continuing Education is drawn from the teaching staffs of the University, from the faculties of neighboring colleges and universities, and from business, professional, and community leaders.

In addition to the programs listed below, it is possible to complete many of the degree requirements in other areas of study offered by the University through enrollment in credit courses scheduled by DCE each semester.

Associate in Arts Degree

See page 15.

Special Student Status

Special students—those who are not formally admitted into a degree program at the University of New Hampshire—may enroll in University credit courses each semester through the Division of Continuing Education.

All special undergraduate students are limited to 11 credits per term unless they obtain written permission from the Dean of Admissions, Thompson Hall. Special graduate students are also subject to enrollment limitations. Contact the Division of Continuing Education for details.

Undergraduate Courses Special students must have a high school diploma or its equivalent, or be at least 18 years of age.

Graduate Courses Special students must hold a bachelor's degree or equivalent from an approved college or university.

Prerequisites All students are responsible for satisfying course prerequisites, if any. Instructors may require students to withdraw from a course if they are not adequately prepared for the level of work.

Academic Standards A cumulative grade-point average of 2.00 (C grade) is the minimum acceptable level for undergraduate work in the University. The Division of Continuing Education Executive Committee examines the records of special undergraduate students periodically and may warn academically deficient or potentially deficient students, or may exclude or suspend those who are academically deficient.

Diploma Programs

To meet the need for University-quality, short-term, career-related programs for adults, the Division has developed career option diplomas in accounting, banking, criminal justice, insurance, library science, general management, small business management, industrial management, office administration, merchandising, and real estate.

Each diploma program consists of four or five credit courses which concentrate on a specific career area. These required courses can normally be completed in two or four semesters of part-time study. Upon successful completion of the required courses, students will be awarded a diploma from the Division of Continuing Education, and the students will have a permanent record of their achievements on file with the University.

Because each diploma program consists of UNH credit courses, students may apply the credits earned toward an appropriate degree program at a later date.

For application forms and further information, contact DCE Academic Advising, Brook House, 862-1548.

Noncredit Courses

Throughout the year, DCE offers noncredit courses to the community. These courses provide opportunities for individual growth or continuing education for groups and individuals in business, labor, education, government, or the professions.

Professional and career development noncredit courses typically meet one evening a week for about 10 weeks, depending

Summer Session

on course objectives. Examples include data processing, business writing, assertiveness training, graphic arts, interior design, skills for teaching, and labor-management relations.

Personal enrichment courses are offered during the day and evening, during the week and on weekends. Examples include physical fitness and recreation, parent-child communication, arts and crafts, local history, current events, personal financial planning, creative writing, and photography.

Noncredit Certificate Programs

Certificate programs consist of specifically developed sequences of courses which provide a sound balance of theory, fundamentals, and specialized training. Certificates of achievement awarded by the Division of Continuing Education have earned professional acceptance as evidence of increased knowledge in basic principles and techniques.

Noncredit certificate programs include public library techniques (summers only), interior design, graphic arts, and paralegal studies.

Conferences and Workshops

The Division also conducts conferences, workshops, and seminars, which range from half-day briefings on specific topics to residential institutes lasting several days or weeks. Such programs are offered on topics of community interest and for the continuing education of business, industry, government, and the professions.

Topics can be developed by the Division of Continuing Education or by outside clients who wish to conduct an educational program for their organization. Facilities are arranged through the New England Center for Continuing Education, adjacent to the UNH campus.

Summer Session

Please see page 81.

Course Charges

Students who enroll in credit courses through the Division of Continuing Education pay on a per-credit basis, depending on residency status and course level. These course charges are listed in the DCE credit course schedule published before each semester. The course charges for noncredit courses and for conferences, workshops, and institutes vary according to the scope of the individual programs.

Financial Aid

Course Charge Grants Special students (nondegree candidates) who enroll in the Division of Continuing Education may be considered for grants in varying amounts, awarded on the basis of financial need and only for course charges in credit courses and approved noncredit programs offered through DCE. Preference will be given to New Hampshire residents. Application for course-charge assistance must be filed with the Division of Continuing Education at least one month before the start of classes for each term for which assistance is requested. Application forms are available from the DCE office.

Other Financial Aid For information on other sources of financial assistance, including Senior Citizen Scholarships, contact the DCE advisers.

Class Schedule

While students may enroll in morning and afternoon classes through the Division, many courses offered each semester are scheduled in the late afternoon and early evening to accommodate evening students.

All courses offered by the University each semester are open to special students on a space-available basis. However, because UNH degree candidates have first priority in many classes, special students may not be assured space in certain classes until the first class meeting.

Division Publications

Specific information on course offerings, registration procedures, and academic requirements can be found in individual publications describing each program. For more information, write: Division of Continuing Education, 6 Garrison Avenue, UNH, Durham, N.H. 03824 (603-862-2015).

Edward J. Durnall, Director

The University of New Hampshire offers students the opportunity to continue their studies on a year-round basis through four- and eight-week sessions during the summer months. The summer courses are of the same high quality as those during the regular academic year and require the same level of academic performance.

Summer Session offerings include a full range of undergraduate and graduate credit courses in most of the major academic disciplines. Throughout the summer, classes are scheduled in the morning, afternoon, and evening.

Enrollment in Summer Session classes does not imply admission to degree candidacy.

Undergraduate Courses

Undergraduate courses are open to college undergraduates, to interested members of the community who have a high school diploma or its equivalent or who are at least 18 years of age, and to high school students completing their junior or senior year (by permission of the director).

Graduate Courses

Graduate courses are open to graduate students and other individuals with a bachelor's degree or its equivalent from an approved college or university.

Other Offerings

Other Summer Session offerings include noncredit courses and certificate programs; workshops and seminars for business, industry, and the professions; and residential conferences and academic programs.

For More Information

A separate summer bulletin is published each year in March and is available from: Division of Continuing Education, 6 Garrison Avenue, University of New Hampshire, Durham, N.H. 03824 (603-862-2015).

82 Graduate School

Raymond L. Erikson, Dean and Director of Research
William H. Drew, Associate Dean
Harry J. Richards, Assistant Dean

Master of Arts

Counseling
Economics
English
  Literature
  Language and Linguistics
  Writing
History
Music
Political Science
Psychology
Sociology
Spanish

Master of Arts in Teaching

  Elementary Education
  Secondary Education

Master of Science for Teachers

Biology
Chemistry
English
Mathematics
Physics
Spanish

Master of Occupational Education

Master of Business Administration

Certificate of Advanced Graduate Study

Counseling
Educational Administration and Supervision

Master of Science

Animal Sciences
Biochemistry
Biology
Botany
Chemical Engineering
Chemistry
Civil Engineering
Communication Disorders
Computer Science
Earth Sciences
  Geology
  Oceanography
Electrical Engineering
Entomology
Genetics
Home Economics
Mathematics
Mechanical Engineering
Microbiology
Music Education
Natural and Environmental Resources
  Forest Resources
  Hydrology
  Resource Economics
  Soil Science
  Resource Administration and Management
  Wildlife Ecology
Physical Education
Physics
Plant Science
Zoology

Master of Education

Administration and Supervision
Counseling
Developmental Disabilities
Early Childhood
Elementary Education
Reading
Secondary Education

Master of Public Administration

Political Science

Doctor of Philosophy

Biochemistry
  Nutrition
Botany
Chemistry
Economics
Engineering
  Signal Processing
  Transport Phenomena
  System Design
  Theory and Applied Mechanics
English
Genetics
History
Mathematics
Mathematics Education
Microbiology
Physics
Plant Science
Psychology
Sociology
Zoology

Graduate School

The Graduate School offers a wide range of programs leading to the master's degree, two programs leading to the C.A.G.S., and a number of programs leading to the Ph.D. degree. Graduate programs have been developed systematically to achieve academic excellence by careful utilization of institutional resources and regional opportunities. A highly qualifed graduate faculty supervises programs and establishes the requirements for admission and degrees, which are administered by the dean of the Graduate School.

Most graduate programs are relatively small and permit students to work closely with faculty in the area of specialization. The aim of graduate programs is to offer high-level professional training in their respective disciplines and to provide opportunities for students to learn and practice sound research methods. Graduate students are expected to use fully the available opportunities and to demonstrate the maturity and self-discipline necessary for sound scholarship.

A number of programs and facilities such as the Genetics Program, Jackson Estuarine Laboratory, Ritzman Animal Nutrition Laboratory, Center for Industrial and Institutional Development, Space Science Center, Resource Development Center, Water Resources Research Center, Engineering Design and Analysis Laboratory, Bureau of Educational Research and Testing, and Public Administration Service provide opportunities to engage in interdisciplinary research.

Admission to the Graduate School may be granted to graduates of colleges and universities of approved standing, provided that applicants' undergraduate records are satisfactory. Applications for admission and the Graduate Bulletin containing detailed descriptions of graduate programs may be obtained from the dean of the Graduate School, Horton Social Science Center, UNH, Durham, New Hampshire 03824.

Financial Aid Graduate assistantships are available in most departments. These involve part-time work in connection with the University's instructional activites. University-sponsored awards, such as tuition scholarships, UNH Fellowships, Martin Luther King awards, and Dissertation Fellowships, are available to qualified students. A number of fellowship programs sponsored by such outside agencies as the National Science Foundation, Department of Health, Education and Welfare, U.S. Office of Education, and the U.S. Public Health Service may be available.

Description of Courses

Explanation of Arrangement

The title and arabic number designate the particular course. When two course numbers precede a course title and are connected by a hyphen, the first semester of the course, or its equivalent, is a prerequisite to the second semester. If the course numbers are separated by a comma, qualified students may take the second semester without having had the first.

In courses that are not designated by title as laboratory courses, the notation "Lab" indicates that laboratory sessions are a part of the course.

Prerequisites and Corequisites

Each prerequisite for a course is separated from the other prerequisites by a semicolon; e.g., Prereq: Educ 601; Psyc 635. If permission (of the instructor, department, adviser, or committee) is a prerequisite for all students, it is listed among the prerequisites: e.g., Prereq: Educ 601; Psyc 635; permission. If, on the other hand, permission may be substituted for one or more of the listed prerequisites, it follows the other prerequisites and is separated from them by a slash mark: e.g., Prereq: Educ 601; Psyc 635; /or permission. If permission may be substituted for only one of the prerequisite courses, it is listed with the course for which it may be substituted: e.g., Prereq: Educ 601 or permission; Psyc 635.

Corequisites are courses that must be taken in the same semester.

Credits

The number of credits listed is the number of semester credits each course number will count toward graduation (except in the case of variable credit courses). Students must register for the number of credits shown or, if the course is variable credit, must register within the range of credits shown.

Cr/F following the description indicates that no letter grade is given but that the course is graded Credit or Fail.

For up-to-date information about when a course is offered; who teaches the course; the number of recitations, lectures, labs, and such, students are referred to each semester's *Time and Room Schedule,* which carries a complete schedule of course offerings for the semester.

The system of numeric designation is as follows:

200-299	Courses in Thompson School of Applied Science.*
300-399	Noncredit courses, e.g., Math 301.
400-499	Introductory courses not carrying prerequisites and courses generally falling within University and college requirements.
500-599	Intermediate-level courses for undergraduate credit only.
600-699	Advanced-level undergraduate courses. Entrance to courses numbered 600 and above normally requires junior standing. (Under some conditions these courses may be taken for graduate credit by nonmajors only.)
700-799	Advanced-level undergraduate courses. (These courses may be taken for graduate credit.)
800-899	Courses which carry graduate credit only. (Descriptions will be found in the Graduate School catalog.)

*UNH baccalaureate or associate degree students should realize that 200-level courses must be taken as audit and that they carry no graduation credits.

Administration (Admn)

PROFESSORS: Carroll M. Degler, emeritus; Donald C. Marschner, emeritus; Robert F. Barlow, John A. Beckett, Jan E. Clee, Allan R. Cohen, Stephen L. Fink, Herman Gadon, Russell Haley, James O. Horrigan, Manley R. Irwin, John J. Korbel, Dwight R. Ladd, Linda G. Sprague, Charles B. Warden, Jr., Robin D. Willits, Dwayne E. Wrightsman
VISITING PROFESSORS: Marvin J. Karson, James W. Kelley
ADJUNCT PROFESSOR: R. Stephen Jenks
ASSOCIATE PROFESSORS: Dale G. Broderick, John M. Burt, Denis F. Healy, Fred R. Kaen, Richard L. Mills, Melvin Sandler, Barry Shore, William E. Wetzel, Jr.
VISITING ASSOCIATE PROFESSORS: John Freear, Roger Millen
ASSISTANT PROFESSORS: John Haskell, Michael Jones, Natasha Josefowitz, Michael Kole, Richard Martin-Diaz, Michael J. Merenda, Steven L. Obert, Starr F. Schlobohm, Gordon D. Smith, Rita Weathersby
LECTURERS: Ray Belles, Robert Boylan, Clyde R. Coolidge, Linnea Hirst, Joseph Michael

411. BEHAVIOR IN ORGANIZATIONS
Application of behavioral science concepts at work. Individual behavior, interpersonal relations, small groups, relations between groups—all in the context of a larger organization. Class treated as a real organization; students study own roles, norms, rewards, and leadership, and take responsibility for the effects of their behavior on learning. 4 cr.

424. QUANTITATIVE ANALYSIS
Introductory coverage of quantitative methods for managerial decision making; probability, inferential and descriptive statistics, regression, decision theory, use of computer, and linear programming. Sufficient quantitative background provided for all other required undergraduate administration courses. 4 cr.

425. APPLICATIONS IN QUANTITATIVE ANALYSIS
The use and misuse of basic analytic skills in administration and economics; methodology and techniques introduced in Admn 424 applied to analysis and interpretation of real-world data. Case studies, student projects, and problems from the media. Prereq: Admn 424 or equivalent. 4 cr.

502. FINANCIAL ACCOUNTING
Concepts, procedures, and tools of analysis in selection, quantification, and communication of economic events affecting financial condition, income and cash flows of organizations. (Not open to students who have had DCE 460.) 4 cr.

503. ACCOUNTING: PLANNING AND CONTROL
Analytical tools and concepts employed by managers for financial planning and control. Prereq: Admn 502. 4 cr.

517. SURVEY OF BASIC ACCOUNTING
Concepts, conventions, and processes in financial and cost accounting. Usefulness and limitations of accounting data in decision making and in analyses of past results. (For students minoring but not majoring in administration. Not open to students who have had DCE 460. No credit for students who have had Admn 502.) 4 cr.

524. INTRODUCTION TO MANAGEMENT SCIENCE
Use of quantitative techniques in decision situations. Topics include probability, Bayes' rule, decision trees, linear programming, inventory models, queuing theory, network analysis under uncertainty, simulation, organizational considerations, and computers. Prereq: Admn 424. 4 cr.

526. INTRODUCTION TO BUSINESS DATA PROCESSING
Fundamentals of data processing with applications to the functional areas of management. Topics include system design, software, hardware, and applications. Prereq: Admn 424. 4 cr.

530. PERSONAL FINANCE AND INVESTMENT
Principles and practices of personal finance and investment. Investments in real estate, stocks and bonds, money-market instruments, savings accounts, and insurance and retirement plans. Personal saving, mortgages, consumer credit, and other means of financing investments. No credit toward a major or minor in administration. 4 cr.

550. SURVEY OF MARKETING
Same material as Admn 651, but more general viewpoint. How companies plan products, pricing, advertising, promotion, distribution. Marketing of services. Consumer behavior. Consumerism. Tailored for nonmajors. Prereq: Econ 402 or permission. No credit for students who have had Admn 651. 4 cr.

602. VALUES IN A MANAGERIAL SOCIETY
The role and influence of values on management decision making. The conflict between traditional values such as material progress, private property, self-interest, etc., and emerging notions about environmentalism, consumerism, worker and product safety, etc. is examined through case discussions and readings. Prereq: Admn major or permission. 4 cr.

614. ORGANIZATIONAL THEORY
Characteristics of formal organizations. Theory and concepts useful for analysis and administration of various types: business, educational, medical, social. Case discussions, class exercises, fieldwork. Prereq: Admn 411 or permission. 4 cr.

647-648. BUSINESS LAW I, II
Law of contracts, agency, sales, negotiable instruments, real and personal property, partnership and corporations, with application of the Uniform Commercial Code. Prereq: at least junior status; permission. 4 cr.

650. OPERATIONS MANAGEMENT
Analysis of operational problems in the product and service sectors; standards, capacity, inventory, scheduling, and control. Prereq: all Group A courses; /or permission. 4 cr.

651. MARKETING
Marketing behavior of the firm as it supplies goods and services to consumers and industrial users. Optimal blending of ingredients in the "marketing mix": product pricing, promotion, preliminary consumer behavior, marketing research, and selection of distribution channels. Prereq: all Group A courses; /or permission. 4 cr.

653. FINANCIAL MANAGEMENT
The firm's uses and sources of funds; working capital management; capital budgeting; and administration of debt and equity. Prereq: all Group A courses; /or permission. 4 cr.

66I. MANAGERIAL THINKING
Thinking processes that underlie management and administration; survey of human thought, history of management thought, and prevailing contemporary models of the management process. Suitable background for all upper-division administration courses. 4 cr.

695-696. INDEPENDENT STUDY
Individual projects of special interest and benefit. Prereq: permission of undergraduate counselor and proposed project supervisor; granted only to students with unusual initiative. 1-12 cr.

86

698. TOPICS IN ADMINISTRATION
Special topics; may be repeated. Prereq: permission. 4 cr.

700. BUSINESS POLICY
Capstone course, interrelating and applying specialized courses; cases of companies, firms, supplemented by economic and other information from published industry, company, and other sources. Prereq: all courses in Group A and Group B. 4 cr.

702. APPLIED STATISTICS
Time series and cross-sectioned data; regression analysis; computerized statistical packages. Experimental design; surveys; contingency analysis. Prereq: Admn 801 or basic statistics; permission. 4 cr.

705. OPERATIONS RESEARCH
Synthesis and analysis of basic principles and methods of operations research applied to managerial decisions. Mathematical programming, networks, inventory, queuing, sequencing, scheduling, and Markovian models. Prereq: permission. 4 cr.

706. ADVANCED OPERATIONS RESEARCH
Analysis and synthesis of complex operations research models. Project is undertaken by all students. Advanced mathematical programming (nonlinear, parametric linear, stochastic, and dynamic), stochastic inventory models, advanced queuing models, and heuristic programs. Prereq: Admn 705 or permission. 4 cr.

708. MODELING AND SIMULATION
Modeling: formulation, data preparation, translation, validation, interpretation, and implementation. Discrete simulation models are developed and applied using a special purpose simulation language. Prereq: Admn 801 and 810 or basic probability and statistics; permission. 4 cr.

712. ORGANIZATIONAL CHANGE
Process of change in organizations. Change strategies; the change agent's role and relation to the client system. Bases of resistance to change and problems encountered by internal and external change agents. Theoretical reading material, cases, and exercises. Prereq: permission. 4 cr.

713. INTERPERSONAL AND GROUP DYNAMICS
Dynamics of small groups through the use of the class itself as an intensive laboratory study group. Students examine their own behavior and its effects on others through the use of the Laboratory Training Group (T-group), and develop conceptual ability and behavioral skills. Readings in group dynamics, interpersonal relations, and sensitivity training. Prereq: permission. Lab fee. 4 cr.

714. CONFLICT MANAGEMENT
Conflict among individuals, small groups, and organizations. Analysis of cases, readings, simulations, and roleplays (often using videotape) develops useful concepts and skills for dealing with conflict. Students examine their own behavior in coping with conflicts within the class. Field project required. Prereq: permission. 4 cr.

715. THEORY AND PRACTICE OF GROUP LEADERSHIP
Intensive comparison of and practice in leading task- and process-oriented groups. Student teams design presentations on leadership topics, then study their own leadership-membership issues. Each student also participates in and leads a process-oriented group. Prereq: Admn 713 or equivalent; permission. 4 cr.

717. ADVANCED FINANCIAL ACCOUNTING
Theory and practice as they contribute to the significance and limitations of the financial statements. Prereq: permission. 4 cr.

718. COST AND MANAGEMENT
Effective use of cost accounting, cost analysis, and budgeting in planning and controlling operations. Analysis of cost behavior, direct and absorption costing, cost-price-volume relationship, distribution costs, transfer pricing, and capital budgeting analysis. Prereq: permission. 4 cr.

720. AUDITING
The attest function, and the responsibility and professional ethics of the independent auditor in our society. Audit concepts, procedures, objectives, and reports. Operational audits, social audits, and management services. Prereq: Admn 717 or permission. 4 cr.

722. TOPICS IN ACCOUNTING
Special topics. Prereq: Admn 717 or 718, depending on topics; permission. 4 cr.

723. TOPICS IN FINANCE
Prereq: Admn 653 or 806. 4 cr.

728. STATISTICAL DECISION MAKING
Probability and statistics applied to decision problems. Bayesian approach to decisions under uncertainty, which explicitly injects prior judgements of decision makers and the consequences of alternative actions. Prereq: Admn 424 or equivalent. 4 cr.

730. INVESTMENTS ANALYSIS
Capital market patterns and techniques useful for security analysis. Securities, market institutions, yield series, random walks, intrinsic-value analyses, and portfolio management. Security analysis research projects. Prereq: permission. 4 cr.

732. EXPLORATION IN ENTERPRENEURIAL MANAGEMENT
Examination of the management of change and innovation with particular attention to the role of the entrepreneur in the management of new ventures. Characteristic behavioral, organizational, financial, and marketing problems of entrepreneurs and new enterprises. Prereq: permission. 4 cr.

741. TRANSPORTATION
Problems of American transportation system. Economic structure of transportation industries; competition among the several modes. Public policy questions: merger, cost-benefit analysis of facilities, for example. Freight transportation; problems of passenger transportation, especially in urban areas. Prereq: permission. 4 cr.

742. MANAGEMENT INFORMATION SYSTEMS
Concepts, design, and implementation of systems to provide information and support for managerial decision making. Use of computers, models, and behavioral factors from the manager's perspective. 4 cr.

745. INTERNATIONAL BUSINESS
Issues and problems confronting managers in the international economy. Emphasis on problems of working across national borders rather than on those encountered within the framework of different national economies, cultures, and institutions. For managers working in a multinational enterprise. Prereq: permission. 4 cr.

747. FEDERAL TAXATION
Current federal income, estate, and gift taxes and their impact on corporations, partnerships, and individuals. Tax analysis and decision making. 4 cr.

750. MARKETING MANAGEMENT
Practical application of theories taught in Admn 651. Planning, organization, and control of marketing activities in large corporations and small businesses; new-product development; pricing policies; selection of channels of distribution; interrelationships between marketing, production, and finance. Sound policy formulation and decision making established through analysis of cases and computer simulation. Prereq: a basic marketing course. 4 cr.

751. ADVERTISING AND PROMOTION
Advertising, personal selling, and other promotional tools to help solve marketing problems; advertising as a medium of communication and as a social-cultural force in the Western world. Prereq: Admn 651 or permission. 4 cr.

752. MARKETING RESEARCH
Identification, collection, and analysis of data for the marketing process. Strengths, limitation, environment, and evaluation of research in the marketing process. Prereq: Admn 424 and 651; /or equivalent. 4 cr.

755. ADVANCED BUSINESS FINANCE
Development of analytical tools and practical skills for recognizing and solving complex problems of business finance. Working-capital management, capital budgeting, cost of capital, capital structure, and dividend policy. Prereq: Admn 653 or 806. 4 cr.

756. MANAGEMENT OF FINANCIAL INSTITUTIONS
How financial institutions manage their sources and uses of funds; impact of external environmental factors upon the operation and performance of financial institutions. Optimal portfolio strategies for commercial banks, savings and loan associations, mutual savings banks, insurance companies, and pension funds. Implications of monetary theory for individual financial institution policies; credit analysis; competition among financial institutions; regulation of financial institutions. Prereq: Admn 653 or 806. 4 cr.

761. SALES MANAGEMENT
Principles and methods of successful salesmanship and management of the sales function. Selling experiences in fields of student interest; case studies, sales presentations; oral and written analyses of sales management issues. Prereq: Admn 651. 4 cr.

762. MARKETING WORKSHOP
Integrative study of a real marketing situation in a business, nonprofit institution, or government agency. Student teams identify problem, research or collect data, suggest alternate solutions, and submit a recommended course of action. Prereq: Admn 651 or Admn 808; one additional advanced marketing course; permission. 4 cr.

770. PERSONNEL ADMINISTRATION
Role of personnel administration and human resource management in achieving goals in "for-profit" and "not-for-profit" organizations. Functions of management; scope, technique, and current issues of personnel administration; organization of personnel activities and staff. How managers relate to personnel administration and interact with personnel administration staff and services. Prereq: permission. 4 cr.

780. WOMEN IN MANAGEMENT
Issues faced by women managers in complex organizations; problems associated with role expectations of women as they move into managerial positions traditionally filled by men. Prereq: senior or graduate standing. 4 cr.

795. INTERNSHIP
On-the-job skill development through fieldwork in an organization (business, industry, health, public service, etc.). Normally, supervision provided by qualified individual in the organization, with frequent consultation by a faculty sponsor. Written report required. Internships may be part- or full-time, with course credits assigned accordingly. 1-16 cr.

798. TOPICS IN ADMINISTRATION
Special topics; may be repeated. Prereq: consent of adviser and instructor. 1-4 cr.

Aerospace Studies (Aero), Reserve Officers Training Corps

PROFESSOR of Aerospace Studies: Colonel Donald L. Miller, USAF
ASSISTANT PROFESSORS: Major Philip J. Bolalek, USAF: Captain Roger L. Cussins, USAF: Captain Ray E. Goodwin, USAF
STAFF: TSgt Joseph A. Gallagher, USAF: SSgt George C. Giroux, Jr., USAF; Sgt David J. Gray, USAF; Mrs. Jeanette K. Carignan

Leadership Laboratory is required each semester of all Air Force ROTC students seeking commissions as second lieutenants in the U.S. Air Force upon graduation. Students taking Air Force ROTC courses for credit, but not seeking commissions, need not register for this lab.

301. LEADERSHIP LABORATORY
Taken by all AFROTC cadets throughout enrollment in AFROTC. Command and staff leadership experiences in cadet corps. Air Force customs and courtesies; drill and ceremonies; career opportunities; life and work of junior officer. Student leadership potential developed in a practical, supervised laboratory. Field trips to Air Force installations. 0 cr.

415. THE AIR FORCE TODAY I
Development, mission, and organization of the Air Force as an instrument of the U.S. national defense policy. 1 cr.

416. THE AIR FORCE TODAY II
Major Air Force commands; roles of separate operating agencies; organization, systems, and operations of strategic defense; general-purpose aerospace support forces. 1 cr.

541. THE DEVELOPMENT OF AIR POWER I
The nature of warfare; development of air power from balloons and dirigibles through World War II. 1 cr.

542. THE DEVELOPMENT OF AIR POWER II
Development of air power from post-World War II through the peaceful use of air power in Berlin; the Cuban crisis; research and development; air war in Southeast Asia. 1 cr.

671. AIR FORCE MANAGEMENT AND LEADERSHIP I
An integrated management course emphasizing the individual as a manager in the Air Force. Motivation and behavior, leadership, communication, group dynamics and decision making in a changing environment. Air Force cases studied. 4 cr.

672. AIR FORCE MANAGEMENT AND LEADERSHIP II
Organizational and personal values; management of forces in change; organizational power, politics, managerial strategy and tactics; Air Force cases studied. 4 cr.

681-682. NATIONAL SECURITY FORCES IN CONTEMPORARY AMERICAN SOCIETY I AND II
A full-year course focused on the armed forces as part of American society, emphasizing civil-military relations in context of U.S. policy formulation and implementation. Attitudes toward the military; socialization processes; role of the professional military leader-manager; requirements for adequate national security forces; political, economic, and social constraints on the national defense structure; impact of technological and international developments on strategic preparedness; the variables involved in the formulation and implementation of national security policy; military justice and administrative law. 3 cr. each.

88

Ancient and Modern Languages and Literatures

CHAIRPERSON: Grover E. Marshall
PROFESSORS: John S. Walsh, emeritus; R. Alberto Casás, Warren Held, Jr., Louis J. Hudon, Charles H. Leighton
ASSOCIATE PROFESSORS: Rose T. Antosiewicz, Roger S. Brown, Richard J. Callan, Lydia L. Crowson, F. William Forbes, Marron C. Fort, Helmut F. Pfanner, Michael J. Rosenbush, John C. Rouman, Jack R. Vrooman
ASSISTANT PROFESSORS: Dwayne E. Carpenter, Barbara T. Cooper, Richard V. Desrosiers, Caren S. Greenberg, Bernadette Komonchak, Grover E. Marshall, James L. Sherman, Denis M. Sweet
INSTRUCTORS: Linda Davis
FACULTY IN RESIDENCE: Vittorio Felaco, Robert J. Forbes, Susan E. Gonye, Jennifer A. Piché, Marybeth L. Spain, Carolyn F. Takahara, Barbara H. Wing
LECTURERS: Jeanne G. Kurtz, Sandi F. Mayewski, Edith M. Toegel

Classics (Clas)

501. CLASSICAL MYTHOLOGY
Survey of the myths and sagas of ancient Greece and Rome. No classical preparation necessary. Background course for majors in English, the arts, music, history, classics, etc. One session weekly devoted to related art and music. 4 cr.

506. INTRODUCTION TO COMPARATIVE AND HISTORICAL LINGUISTICS
Major language families (primarily Indo-European) and the relationships among languages within a family. Diachronic studies; methods of writing; linguistic change; glottochronology; etymological studies. Some language training and Ling 505 desirable. (Also offered as Ling 506.) 4 cr.

512. GREEK AND LATIN LITERATURE IN TRANSLATION
The dimensions of the ancient Greco-Roman civilization from which so much of our contemporary culture derives. For students unprepared to read Greek and Latin. Background course for majors in English, history, Latin, Greek, and the modern languages and literatures. 4 cr.

521, 522. MASTERPIECES OF GRECO-ROMAN CULTURE IN TRANSLATION
More advanced study of the writings of classical civilizations. For students with some classical preparation. Background course for majors in English, history, Latin, Greek, or the modern languages and literatures. 4 cr.

595, 596. TOPICS IN CLASSICS
Introduction and elementary study related to linguistic study of Latin and Greek or relevant to Greco-Roman culture and history. Primarily for students unprepared to read Latin and Greek. Topics: A) Byzantine Heritage; B) Greek and Latin Origins of Medical Terms; C) Greek and Latin Origins of Legal Terms; D) Greek and Latin Origins within the English Language; E) Hellenic Institutions; F) Roman Institutions; G) Classical Backgrounds of Modern Literature; H) Sanskrit; I) Hittite; J) Classical Archaeology, 2 or 4 cr.

695, 696. SPECIAL STUDIES IN CLASSICS
Advanced work in classics. Research paper. Not open to freshmen and sophomores. 2 or 4 cr.

French (Fren)

New students will be assigned to the proper course on the basis of their scores on the College Board Achievement Test. All courses are conducted in French unless otherwise noted. Junior and senior nonmajors may write papers and examinations in English in courses numbered 600 and above. Fren 605-606 is the first course counting toward a major. Students educated in French-speaking countries may not register for courses below the 700 level. Transfer credit will not be given for elementary-level college courses in foreign languages if students have had two or more years of the foreign language in secondary school.

401-402. ELEMENTARY FRENCH
For students without previous training in French. Aural comprehension, speaking, writing, reading. Labs. No credit for Fren 401 without Fren 402. (No credit for students who have had two or more years of French in secondary school; however, any such students whose studies of French have been interrupted for a significant period of time should consult the section coordinator about possibly receiving credit.) 4 cr.

501. REVIEW OF FRENCH
Emphasis upon reading French texts with extensive oral/aural work in class and in lab. Review of basic grammar. Designed primarily for those whose study of French has been interrupted and for those who have had only two years of high school French. 4 cr.

503-504. INTERMEDIATE FRENCH
Intensive critical reading of complete texts; formal review of grammar. Training in oral and written expression of ideas. Labs. 4 cr.

514. FRENCH GRAMMAR AND SPEECH
Thorough review of grammar and practice in oral and written expression. Extensive use of language laboratory. Prereq: Fren 504. Not for major credit. 4 cr.

516. FRENCH CONVERSATION
Readings from current French periodicals and from material illustrating various aspects of contemporary France. Emphasis on increasing oral skills through class discussions and reports. Labs. Prereq: Fren 514 or grade of B (3.0) or better in Fren 504. Not for major credit. 4 cr.

605-606. READINGS IN FRENCH LITERATURE
Analysis of texts from the 17th century to the present. Prereq: grade of C (2.0) or better in Fren 504. 4 cr.

620. THE NOVEL OF QUEBEC
Novel of Quebec as a reflection of a society, its attitudes and development. Readings in French. Taught in French or English as circumstances dictate. Papers and examinations in English for nonmajors. Prereq: Fren 504 or equivalent. 4 cr.

621. FRENCH PROSE IN TRANSLATION
Works affecting French thought from the Renaissance to the modern period. Readings, discussion, papers in English. Not for major credit. 4 cr.

622. FRENCH DRAMA IN TRANSLATION
Major works of comedy, tragedy, and drama. Moliére and Racine to the present day. Readings, discussions, papers in English. Not for major credit. 4 cr.

685-686. JUNIOR YEAR AT DIJON UNIVERSITY
Studies at the University of Dijon (France) for juniors who have completed their sophomore year at UNH and have passed with a grade of B or better Fren 605-606 and Fren 514. Students are expected to take French courses in each semester of their freshman and sophomore years. Attendance required at orientation sessions during the second semester of sophomore year. Interested students should consult the director of the program. Prereq (nonmajors): permission. (Not offered for graduate credit.) 32 cr. Cr/F.

741. FRENCH LITERATURE OF THE MIDDLE AGES
Epic, lyric poetry, and romance. Prereq: Fren 605. 4 cr. (Not offered every year.)

742. FRENCH LITERATURE OF THE RENAISSANCE
Prereq: Fren 605. 4 cr. (Not offered every year.)

759-760. FRENCH LITERATURE OF THE 17TH CENTURY
Prereq: Fren 605. 4 cr. (Not offered every year.)

761-762. 18TH CENTURY FRENCH LITERATURE AND THOUGHT
Prereq: Fren 605. 4 cr. (Not offered every year.)

767-768. 19TH CENTURY FRENCH LITERATURE
Romanticism and Realism. Prereq: Fren 606. 4 cr. (Not offered every year.)

770. INTRODUCTION TO MODERN FRENCH POETRY
Baudelaire to the present. Prereq: Fren 606. 4 cr. (Not offered every year.)

781-782. CONTEMPORARY FRENCH NOVEL AND THEATER
From 1890 to the present. Prereq: Fren 606. 4 cr. (Not offered every year.)

790. ADVANCED LANGUAGE AND STYLE
Translation of literary texts, intensive study of principal techniques of style, explication de textes. Prereq: at least two courses in French numbered 741 and above. 4 cr.

791. METHODS OF FOREIGN LANGUAGE TEACHING—FRENCH
Interdepartmental course. Objectives, methods, and techniques in teaching Spanish, French, German, and Latin from elementary grades through college. Discussion, demonstration, preparation of instructional materials, microteaching of the language skills. Prereq: permission. Not for major credit. (Same as Germ 791, Latn 791, and Span 791.) 4 cr.

795, 796. SPECIAL STUDIES IN FRENCH LANGUAGE AND LITERATURE
Individual guided study of the work of a major author, a genre, or specific topics in literature. Training in bibliography and organization of material. Prereq: permission. 1-4 cr.

798. SEMINAR IN FRENCH LITERATURE
Topics chosen by the instructor. May be repeated for credit barring duplication of material. Prereq: Fren 606. 4 cr. (Not offered every year.)

German (Germ)

New students will be assigned to the proper course on the basis of their scores on the College Board Achievement Test. Transfer credit will not be given for elementary-level college courses in foreign languages if students have had two or more years of the foreign language in secondary school.

401-402. ELEMENTARY GERMAN
For students without previous training in German. Aural comprehension, speaking, writing, reading. Labs. (No credit for students who have had two or more years of German in secondary school; however, any such students whose studies of German have been interrupted for a significant period of time should consult the section coordinator about possibly receiving credit.) 4 cr.

403-404. GERMAN FOR READING KNOWLEDGE
Reading in the natural, physical, and social sciences and the humanities. Previous knowledge of German not required. (No credit for students who have had two or more years of German in secondary school; however, any such students whose studies of German have been interrupted for a significant period of time should consult the section coordinator about possibly receiving credit.) 4 cr.

407. ACCELERATED GERMAN
401-402 in one semester. Active use of the German language employing audiovisual techniques. Labs. Previous knowledge of German not required. (No credit for students who have had two or more years of German in secondary school; however, any such students whose studies of German have been interrupted for a significant period of time should consult the section coordinator about possibly receiving credit.) 8 cr.

501. REVIEW OF GERMAN
Emphasis upon aural-oral practice; review of basic structures; reading and writing to develop active command of the language. Labs. Designed primarily for those whose study of German has been interrupted and for those who have had only two years of high school German. 4 cr.

503-504. INTERMEDIATE GERMAN
A continuation of Germ 401-402. Instruction in German. Labs. 4 cr.

525. INTRODUCTION TO GERMAN CULTURE AND CIVILIZATION
Homogeneous and heterogeneous aspects of the political, social, and cultural life of East Germany, West Germany, Austria, and Switzerland. Conducted in English. This course or its equivalent required of all German majors and strongly recommended for participants in the Salzburg program. 4 cr.

526. INTRODUCTION TO GERMAN LITERATURE
Reading and analysis of poems, dramas, and short prose from the works of Goethe, Heine, Rilke, Kafka, Brecht, Dürrenmatt, and others; introduction to theory of literary forms. Conducted in German. This course or its equivalent required of all German majors going on the Salzburg program; prerequisite to upper-level literature courses. 4 cr.

530. GERMAN CONVERSATION
Dialogues in German concerning living and studying in Austria and Germany. Necessary for those participating in the Junior Year in Salzburg Program. Prereq: Germ 401-402 and 503; /or equivalent. 2 cr.

601-602. ADVANCED LANGUAGE AND STYLE
Essential for all students intending to engage in study or research in a German-speaking country. Essays and oral reports. Required of all German majors; not open to students who will have taken the equivalent courses in Salzburg. 4 cr.

90

685-686. JUNIOR YEAR IN SALZBURG
A program of studies at the University of Salzburg (Austria) for students of colleges and universities in New England who have completed their sophomore year and have passed a minimum of four full courses in German with an average grade of B (3.0) or better and have an overall gradepoint average of C+ (2.33). Students are to take German 530, German Conversation, (2 cr) before going; and German majors are required to take German 526. Students participating are expected to attend a four-week, noncredit orientation seminar in Salzburg before the beginning of the fall semester. Open to all students regardless of major. Interested students should consult the director, Studies Abroad Program. Variable to 32 cr. for UNH degree candidates.

691, 692. ADVANCED STUDIES IN GERMAN
A special series of 2-credit courses to develop a knowledge of German language, culture, literature, e.g., A) The Faust Legend; B) Cultural Comparison of the U.S. and Germany; C) Readings in Current Periodicals; D) North Germany: Land and People; E) German Mythology; F) Modern Short Story; G) Germany Tour. 2 cr.

693, 694. MAJOR GERMAN AUTHORS IN ENGLISH
Critical reading of major works of one of the following authors. Conducted in English. (German majors read all works in original.) A) Brecht; B) Frisch and Dürrenmatt; C) Other. Barring duplication of material, course may be repeated for credit. 4 cr.

723. SURVEY OF PRECLASSICAL GERMAN LITERATURE
German literature from its beginning until the late 18th century. Prereq: Germ 526. 4 cr.

724. THE AGE OF GOETHE
Major literary movements between 1770 and 1832. Reading and analysis of selected works. Prereq: Germ 526. 4 cr.

726. GERMAN CULTURE AND CIVILIZATION
Historical, social, artistic, and folkloristic developments in German-speaking countries from the beginnings to the present. 4 cr.

727. GERMAN LITERATURE OF THE 19TH CENTURY
Major literary movements from Goethe's death to the unification of Germany by Bismarck (1832-1872). Reading and analysis of selected works. Prereq: Germ 526. 4 cr.

728. MODERN GERMAN LITERATURE
Major literary movements from 1872 to the present. Reading and analysis of selected works. Prereq: Germ 526. 4 cr.

781. HISTORY AND DEVELOPMENT OF THE GERMAN LANGUAGE
The changes in sounds, structure, and vocabulary from the earliest record to the present. 4 cr.

791. METHODS OF FOREIGN LANGUAGE TEACHING—GERMAN
Interdepartmental course. Objectives, methods, and techniques in teaching Spanish, French, Latin, and German from elementary grades through college. Discussion, demonstration, preparation of instructional materials, microteaching of the language skills. Prereq: permission. (Same as Fren 791, Latn 791, and Span 791.) 4 cr.

797, 798. SPECIAL STUDIES IN GERMAN CULTURE AND CIVILIZATION
Independent investigation; barring duplication of material, may be repeated for credit; presumes a sound background in Germanic studies. 1-4 cr.

Greek (Grek)

New students will be assigned to the proper course on the basis of their scores on the College Board Achievement Test. Transfer credit will not be given for elementary-level college courses in foreign languages if students have had two or more years of the foreign language in secondary school.

401-402. ELEMENTARY GREEK
Grammar, simple composition, and translation. (No credit for students who have had two or more years of Greek in secondary school; however, any such students whose studies of Greek have been interrupted for a significant period of time should consult the section coordinator about possibly receiving credit.) 4 cr.

403-404. ELEMENTARY MODERN GREEK
Aural-oral practice and the study of fundamental speech patterns, reading, and writing to achieve a firm basis for an active command of the language. Lab. 4 cr.

503-504. INTERMEDIATE GREEK
Readings from Xenophon, Plato, Herodotus, Euripides, and the New Testament. Prereq: Grek 402. 4 cr.

601-602. GREEK PROSE COMPOSITION
Review of Attic Greek grammar; study of Greek prose style; English to Greek translation. Prereq: permission. 4 cr.

751, 752. HOMER AND THE ARCHAIC PERIOD
Readings from the *Iliad*, the *Odyssey*, the Homeric hymns, Hesiod, Pindar, and the lyric poets. Prereq: permission. 4 cr.

753, 754. ADVANCED STUDIES IN ATHENIAN LITERATURE
A) Aeschylus; B) Sophocles; C) Euripides; D) Aristophanes; E) Herodotus; F) Thucydides; G) Xenophon; H) Plato; I) Aristotle; J) Lysias; K) Demosthenes; L) Isocrates. Major Attic authors from the Battle of Marathon to the death of Alexander the Great. Prereq: permission. 4 cr.

795, 796. SPECIAL STUDIES IN GREEK
A) Pre-Socratic Philosophers; B) Hellenistic Greek Authors; C) Menander; D) Callimachus; E) Apollonius of Rhodes; F) Theocritus; G) Polybius; H) Greek Authors of the Roman Empire; I) Plutarch; J) Septuagint; K) New Testament; L) Greek Church Fathers; M) Byzantine Authors; N) Spoken Greek; O) Advanced Greek Composition; P) Introduction to Classical Scholarship; Q) Greek Epigraphy; R) Greek Dialects; S) Comparative Grammar of Greek and Latin; T) Homer: A Linguistic Analysis; U) Greek Institutions; V) Palaeography and Textual Criticism. Topics selected by instructor and student in conference. Prereq: permission. 2 or 4 cr.

Italian (Ital)

New students will be assigned to the proper course upon consultation with the section coordinator. Students educated in Italian-speaking countries may not register for courses below the 700 level. Transfer credit will not be given for elementary-level college courses in foreign languages if students have had two or more years of the foreign language in secondary school.

401-402. ELEMENTARY ITALIAN
For students without previous training in Italian. Aural comprehension, speaking, writing, reading. Labs. No credit for Ital 401 without Ital 402. (No credit for students who have had two or more years of Italian in secondary school; however, any such students whose studies of Italian have been interrupted for a significant period of time should consult the section coordinator about possibly receiving credit.) 4 cr.

407. ACCELERATED ITALIAN
Ital 401-402 in one semester. Aural comprehension, speaking, writing, reading. Labs. (No credit for students who have had two or more years of Italian in secondary school; however, any such students whose studies of Italian have been interrupted for a significant period of time should consult the section coordinator about possibly receiving credit.) 8 cr.

503-504. INTERMEDIATE ITALIAN
A complete review of the fundamentals of grammar and syntax. Selected readings as a general introduction to Italian civilization and culture. Labs. 4 cr.

605. READINGS IN MODERN ITALIAN LITERATURE
Analysis of 19th and 20th century texts. Discussion and papers in Italian. Prereq: grade of C (2.0) or better in Ital 504. 4 cr.

606. READINGS IN ITALIAN LITERATURE TO THE 18TH CENTURY
Analysis of texts of the 13th to the 18th century. Discussion and papers in Italian. Prereq: grade of C (2.0) or better in Ital 504. 4 cr.

795, 796. INDEPENDENT STUDY IN ITALIAN LANGUAGE AND LITERATURE
Individual guided study. Prereq: permission. 1-4 cr.

Japanese (Russ)

415-416. ELEMENTARY JAPANESE
Elements of Japanese grammar. Oral practice and written drills designed to achieve a mastery of basic grammatical patterns. Reading of graded exercises introducing the student to written Japanese (Hiragana and Katakana) and Chinese characters used in contemporary Japan. Labs. (No credit for students who have had two or more years of Japanese in secondary school; however, any such students whose studies of Japanese have been interrupted for a significant period of time should consult the department chairperson about possibly receiving credit.) 4 cr.

515-516. INTERMEDIATE JAPANESE
Review of Japanese grammar. Reading of prose and practice in oral and written expression. Emphasis upon contemporary Japanese. Labs. Prereq: permission; /or Russ 416 with a grade of C (2.0) or better. 4 cr.

517-518. TOPICS IN JAPANESE LANGUAGE
Further work in Japanese for those who have completed Russ 516. Prereq: permission. 2 cr.

Latin (Latn)

New students will be assigned to the proper course on the basis of their scores on the College Board Achievement Test. Transfer credit will not be given for elementary-level courses in foreign languages if students have had two or more years of the foreign language in secondary school.

401-402. ELEMENTARY LATIN
Elements of grammar, reading of simple prose. Course cannot be counted for major credits. (No credit for students who have had two or more years of Latin in secondary school; however, any such students whose studies of Latin have been interrupted for a significant period of time should consult the section coordinator about possibly receiving credit.) 4 cr.

501. REVIEW OF LATIN
Intensive review of Latin grammar and vocabulary. Designed primarily for those whose study of Latin has been interrupted for a year or more and for those who have had only two years of high school Latin. 4 cr.

503-504. INTERMEDIATE LATIN
Review. Readings from Cicero, Caesar, Sallust, Livy, Catullus, Horace, Ovid, Plautus, Terence, and Seneca. Prereq: Latn 402 or equivalent. 4 cr.

601-602. LATIN PROSE COMPOSITION
Grammar review; study of Latin prose style; English to Latin translation. Prereq: permission. 4 cr.

751, 752. CICERO AND THE ROMAN REPUBLIC
Prereq: permission. 4 cr.

753, 754. ADVANCED STUDIES IN THE LITERATURE OF THE GOLDEN AGE
A) Lucretius; B) Catullus; C) Caesar; D) Sallust; E) Vergil; F) Horace; G) Tibullus; H) Propertius; I) Ovid; J) Livy. Major Roman authors from the dictatorship of Sulla to the death of Augustus. Prereq: permission. 4 cr.

755, 756. ADVANCED STUDIES IN THE LITERATURE OF THE SILVER AGE
A) Seneca the Younger; B) Persius; C) Petronius; D) Lucan; E) Statius; F) Quintilian; G) Martial; H) Juvenal; I) Tacitus; J) Pliny the Younger. Major Roman authors from the reign of Nero to the death of Trajan. Prereq: permission. 4 cr.

791. METHODS OF FOREIGN LANGUAGE TEACHING—LATIN
Interdepartmental course. Objectives, methods, and techniques in teaching Spanish, French, German, and Latin from elementary grades through college. Discussion, demonstration, preparation of instructional materials, microteaching of the language skills. Prereq: permission. (Same as Fren 791, Germ 791, and Span 791.) 4 cr.

795, 796. SPECIAL STUDIES IN LATIN
A) Minor Authors of the Republic; B) Plautus; C) Terence; D) Minor Authors of the Empire; E) Suetonius; F) Latin Church Fathers; G) Medieval Latin; H) Advanced Latin Composition; I) Introduction to Classical Scholarship; J) Latin Epigraphy; K) Italic Dialects; L) Comparative Grammar of Greek and Latin; M) Roman Law. Topics selected by instructor and student in conference. Prereq: permission. 2 or 4 cr.

Russian (Russ)

New students will be assigned to the proper course on the basis of their scores on the College Board Achievement Test. Transfer credit will not be given for elementary-level college courses in foreign languages if students have had two or more years of the foreign language in secondary school.

401-402. ELEMENTARY RUSSIAN
Oral-aural practice and written drills designed to achieve a mastery of basic grammatical patterns. Labs. Previous knowledge of Russian not required. (No credit for students who have had two or more years of Russian in secondary school; however, any such students whose studies of Russian have been interrupted for a significant period of time should consult the section coordinator about possibly receiving credit.) 4 cr.

503-504. INTERMEDIATE RUSSIAN
Continuation of Russ 401-402. Review of Russian grammar, reading of prose, and practice in oral and written expression. Labs. Prereq: Russ 402 or equivalent high school or college course with a grade of C or better. 4 cr.

505, 506. RUSSIAN FOR CONVERSATION OR READING KNOWLEDGE
A) Designed to increase fluency in Russian conversation and improve phonetic articulation. B) Designed to increase versatility in reading Russian texts in the natural, physical, and social sciences. Prereq: Russ 401-402; /or permission. 2 cr.

92

521. SURVEY OF RUSSIAN LITERATURE IN ENGLISH
Russian literature of the last 150 years as represented by Pushkin, Gogol, Tolstoy, Dostoevsky, Solzhenitsyn. Readings, discussions, papers in English. 4 cr.

563. INTRODUCTION TO RUSSIAN CULTURE AND CIVILIZATION
A survey course, thematically organized, drawing upon Russian and Soviet literature, history, politics, art, and ideological currents to create a composite portrait of the evolution of Russian and Soviet culture. (Also offered as Hist 563.) 4 cr.

593. DOSTOEVSKY
Evolution of Dostoevsky as artist, thinker, and social critic. Discussion and analysis of major fictional and doctrinal works. Readings, papers, and discussions in English. Majors must register for Russ 693. 4 cr. (Not offered every year.)

594. TOLSTOY
Evolution of Tolstoy as artist, thinker, and social critic. Discussion and analysis of major fictional and doctrinal works. Readings, papers, and discussions in English. Majors must register for Russ 694. 4 cr. (Not offered every year.)

595, 596. RUSSIAN TOPICS IN ENGLISH
A series to develop insight and knowledge of Russian culture and literature, e.g., A) Soviet Union Culture and Study Tour; B) Satire, Parody, Comedy, and Humor in Russian Literature; C) Soviet Literature; D) Special Topics in Culture and Literature. Knowledge of Russian not required. 2 or 4 cr.

597. CHEKHOV
Evolution of Chekhov as artist, thinker, and social critic. Discussion and analysis of major fictional and doctrinal works. Readings, papers, and discussions in English. Majors must register for Russ 697. 4 cr. (Not offered every year.)

631-632. ADVANCED RUSSIAN CONVERSATION AND COMPOSITION
Advanced spoken and written Russian to maintain aural-oral fluency; advanced grammar. Individual conferences. Prereq: Russ 503-504 or equivalent. 4 cr.

691, 692. ADVANCED STUDIES IN RUSSIAN
A series of 2- or 4-credit courses on specialized topics to increase knowledge of Russian language, culture, and literature; e.g., A) Readings in Russian Culture and Civilization; B) Russian Drama; C) Russian Comedy and Humor; D) Russian Poetry; E) Russian Short Story; F) Gogol; G) Readings in Current Soviet Periodicals; H) Structure of the Russian Language; I) Special Topics in Russian. Prereq: Russ 503-504; /or permission. 2 or 4 cr.

693. DOSTOEVSKY
Same as Russ 593, taken for major credit, with selected readings done in Russian. 4 cr. (Not offered every year.)

694. TOLSTOY
Same as Russ 594, taken for major credit, with selected readings done in Russian. 4 cr. (Not offered every year.)

697. CHEKHOV
Same as Russ 597, taken for major credit, with selected readings done in Russian. 4 cr. (Not offered every year.)

733. PROBLEMS IN STRUCTURE OF THE RUSSIAN LANGUAGE
Focuses on specific problems in the structure of the Russian language. Barring repetition of material, may be repeated for credit. Prereq: Russ 631-632; /or permission. 2 or 4 cr.

734. READINGS IN RUSSIAN LITERATURE
Reading and translation of selected works from Russian literature of the 19th and 20th centuries; samples of prose and poetry; problems of vocabulary building. Prereq: Russ 631-632, or courses in Russ 691, 692; /or permission. 4 cr.

795, 796. SPECIAL STUDIES IN RUSSIAN LANGUAGE AND LITERATURE
Selected topics in language, culture, and literature. 1-4 cr.

Spanish (Span)

New students will be assigned to the proper course on the basis of their scores on the College Board Achievement Test. Transfer credit will not be given for elementary-level college courses in foreign languages if students have had two or more years of the foreign language in secondary school. No student educated in a foreign country or for whom Spanish is the native tongue will be permitted to register for any Spanish course numbered 650 or below. All courses conducted in Spanish (or Portuguese) except where noted.

401-402. ELEMENTARY SPANISH
For students without previous knowledge of Spanish. Aural-oral practice; fundamental speech patterns; reading and writing to achieve a firm basis for an active command of Spanish. Labs. No credit toward a major. (No credit for students who have had two or more years of Spanish in secondary school; however, any such students whose studies of Spanish have been interrupted for a significant period of time should consult the section coordinator about possibly receiving credit.) 4 cr.

403-404. ELEMENTARY PORTUGUESE
For students without previous knowledge of Portuguese. Aural-oral practice; fundamental speech patterns; reading and writing to achieve a firm basis for an active command of the language. Labs. No credit toward a major. (No credit for students who have had two or more years of Portuguese in secondary school; however, any such students whose studies of Portuguese have been interrupted for a significant period of time should consult the section coordinator about possibly receiving credit.) 4 cr.

407. ACCELERATED SPANISH
Span 401-402 in one semester. Study of fundamental speech patterns, reading and writing to achieve a firm basis for active command of Spanish. Labs. Previous knowledge of Spanish is not required. (No credit for students who have had two or more years of Spanish in secondary school; however, any such students whose studies of Spanish have been interrupted for a significant period of time should consult the section coordinator about possibly receiving credit.) 8 cr.

501. REVIEW OF SPANISH
Emphasis on aural-oral practice; review of basic structure; reading and writing to develop active command of the language. Labs. Designed primarily for those whose study of Spanish has been interrupted and for those who have had only two years of high school Spanish. 4 cr.

503-504. INTERMEDIATE SPANISH
Complete literary texts of intellectual worth; review of language structure; oral and written expression of ideas. Discussion and papers in Spanish. Labs. Open to students who have passed Span 402 with a C (2.0). No credit toward the major for 503. 4 cr.

507-508. INTERMEDIATE PORTUGUESE
Conversation and composition based on readings in contemporary Portuguese and Brazilian literature, especially theater, which is closest to conventional language. A traditional grammar text supplements reading. Labs. 4 cr.

525. SPANISH CIVILIZATION AND CULTURE
Historical, geographical, and artistic expressions of Spanish civilization which have formed the character of contemporary Spanish culture. Readings, slides, films, tapes, and records. Conducted in English. Majors must take either 525 or 526, but both may not be counted for major credit. 4 cr.

526. LATIN AMERICAN CIVILIZATION AND CULTURE
Significant historical, geographical, and artistic expressions of pre-Colombian and Latin American civilization. Readings, slides, films, tapes, records. Conducted in English. Majors must take either 525 or 526, but both may not be counted for major credit. 4 cr.

601. SPANISH PHONETICS
Practical application of fundamental phonetic theory to spoken Spanish. Required of Spanish majors. 2 cr.

621. SPANISH AND PORTUGUESE LITERATURE IN TRANSLATION
Major works by principal authors, such as: Camoens, Cervantes, Lope de Vega, Calderón, Eça de Queiroz, Unamuno, Ortega y Gasset, Garcia Lorca, Casona, etc. Readings, discussions, papers in English. Does not count for Spanish major. 4 cr.

622. LATIN AMERICAN AND BRAZILIAN LITERATURE IN TRANSLATION
Major works by principal authors, such as: Inca Garcilaso, Diaz del Castillo, Machado de Assis, Borges, Asturias, Neruda, E. Veríssimo, Fuentes, Leñero, Guimarães Rosa, and Jorge Amado. Readings, discussion, papers in English. Does not count toward Spanish major. 4 cr.

631, 632. ADVANCED SPANISH CONVERSATION AND COMPOSITION
To maintain and perfect written and spoken Spanish through intensive classroom work, individual conferences, and laboratory sessions. Prereq: Span 504 or equivalent. 4 cr.

One course from Span 651, 652, 653, 654 (or an equivalent course) is prerequisite to all higher literature courses in Spanish.

651, 652. INTRODUCTION TO SPANISH LITERATURE AND THOUGHT
Reading and analysis of major works within the historical, cultural, and social background of the Iberian peninsula. Papers, discussion, and examinations in Spanish. Prereq: Span 631-632. May be taken concurrently with Span 632 with permission of adviser. 4 cr.

653, 654. INTRODUCTION TO LATIN AMERICAN LITERATURE AND THOUGHT
Reading and analysis of major works within the historical, cultural, and social background of the New World. Papers, discussion, and examinations in Spanish. Prereq: Span 631-632. May be taken concurrently with Span 632 with permission of adviser. 4 cr.

685, 686. JUNIOR YEAR ABROAD
Program of studies at a Spanish or Latin American university for juniors who have completed sophomore year at UNH and passed Span 503-504 or equivalent with grade of B (3.0) or better. Students required to take noncredit orientation meetings during the semester prior to departure. Interested students should consult with the program directors. Variable to 16 cr.

691, 692. READINGS IN CURRENT PERIODICALS
Advanced practice in reading, speaking, and writing, based on current events in contemporary periodicals of the Spanish-speaking world. Co- or prereq: Span 632 or equivalent. May be repeated. 2 cr.

752. DRAMA AND POETRY OF THE SIGLO DE ORO
Social and historical background of the baroque period. Representative plays of Lope de Vega, Tirso de Molina, Calderón; lyric poetry of Lope, Góngora, and Quevedo; prose developments. Prereq: Span 652 or 654 or equivalent. 4 cr. (Not offered every year.)

754. CERVANTES
Cervantes' literary art. Selections from the major works. The Quijote, its originality and significance; its antecedents; its religious, philosophical, and sociological aspects; and its artistic structure. Prereq: Span 652 or 654 or equivalent. 4 cr. (Not offered every year.)

755. LITERATURE OF THE 19TH CENTURY
Larra, Espronceda, Bécquer, Pérez Galdós, and Blasco Ibáñez. Romanticism, realism, and naturalism. Prereq: Span 652 or 654 or equivalent. 4 cr. (Not offered every year.)

757. THEATER AND POETRY OF THE 20TH CENTURY
The Generation of 1898 and Modernismo: Lorca, Casona, Buero Vallejo, Sastre, Salinas, Guillén, and Miguel Hernández. Prereq: Span 652, 654, or equivalent. 4 cr. (Not offered every year.)

758. SPANISH PROSE OF THE 20TH CENTURY
Novels, short stories, and essays. Unamuno, Baroja, Menendez Pidal, Ortega y Gasset, Julián Mariás, Aranguren, Perez de Ayala, Gironella, and Cela; survey of contemporary prose. Prereq: Span 652, 654, or equivalent. 4 cr. (Not offered every year.)

760. UNAMUNO AND ORTEGA Y GASSET
Philosophical ideology and literary content of major contributions of Miguel de Unamuno and José Ortega y Gasset. Prereq: Span 652, 654, or equivalent; /or permission. 4 cr. (Not offered every year.)

771. LATIN AMERICAN DRAMA
From pre-Hispanic origins to the present, modern playwrights of Mexico and Puerto Rico. Prereq: Span 652, 654, or equivalent. 4 cr. (Not offered every year.)

772. LATIN AMERICAN NOVEL
Development from romanticism to the present; contemporary trends and techniques. Prereq: Span 652, 654, or equivalent. 4 cr. (Not offered every year.)

773. LATIN AMERICAN SHORT STORY
Representative authors; stress on 20th century. Principles of interpretation. Prereq: Span 652, 654, or equivalent. 4 cr. (Not offered every year.)

774. MAJOR LATIN AMERICAN AUTHORS
Works and lives of selected writers; pertinent historical circumstances. Prereq: Span 652, 654, or equivalent. 4 cr. (Not offered every year.)

791. METHODS OF FOREIGN LANGUAGE TEACHING—SPANISH
Interdepartmental course. Objectives, methods, and techniques in teaching Spanish, French, German, and Latin from elementary grades through college. Discussion, demonstration, preparation of instructional materials, microteaching of the language skills. Prereq: permission. (Same as Fren 791, Germ 791, and Latn 791.) 4 cr.

94

795, 796. SPECIAL STUDIES IN SPANISH LANGUAGE AND LITERATURE
A) The History of the Spanish Language; B) Medieval Spanish Literature; C) Spanish Literature of the Renaissance; D) Spanish Literature of the Golden Age; E) Spanish Literature of the 18th and 19th Centuries; F) Spanish Literature of the 20th Century (1898-1936); G) Contemporary Spanish Literature; H) Latin American Literature of the 16th and 17th Centuries; I) Latin American Literature of the 18th and 19th Centuries; J) Latin American Literature of the 20th Century; K) Contemporary Latin American Literature; L) Structural and Applied Linguistics; M) Spanish Literary Criticism; N) Latin American Essay; O) Latin America; P) Catalan; Q) Spanish Poetry; R) Latin American Poetry; S) Galdós; T) Archetype Latin American Literature; U) Special Teaching Problems; V) Spanish Civilization and Culture; W) Latin American Civilization and Culture; X) Borges; Y) Spanish Theater; Z) Spanish for Graduates (two-semester course must be taken in sequence); AA) Hispanic Minorities of the United States; BB) Portuguese. Guided study with training in bibliography and organization of material. Topics selected by instructor and student in conference. Prereq: permission of the major supervisor. 2 or 4 cr.

Animal Sciences (AnSc)

CHAIRPERSON: Winthrop C. Skoglund
PROFESSORS: Fred E. Allen, emeritus; C. Hilton Boynton, emeritus; Harry A. Keener, emeritus; Kenneth S. Morrow, emeritus; Richard C. Ringrose, emeritus; Richard Warren, emeritus; Walter M. Collins, William R. Dunlop, James B. Holter, Winthrop C. Skoglund, Samuel C. Smith, Larry L. Stackhouse, Richard G. Strout
ASSOCIATE PROFESSORS: Alan C. Corbett, emeritus; Thomas P. Fairchild, Gerald L. Smith
ASSISTANT PROFESSORS: Janet C. Briggs, William E. Berndtson, William C. Condon, Ginny W. Darr, Walter E. Hylton, Alan H. Parsons, Charles Schwab, James W. Smith
LECTURERS: Dwight E. Barney, Amy S. Dickens, Bernard W. Gaiser, Jr., Joseph J. Moore, Elizabeth C. Smith

400. ANIMALS, FOOD, AND MAN
Nutrition and food science; biological, social, political, economic, and historical significance of food. Animal food products. S. Smith, staff. 4 cr.

401. INTRODUCTION TO THE ANIMAL SCIENCES
Development, economic importance, and problems of the livestock industry; commercially important classes of farm animals; and the place of the biological sciences in animal agriculture. Mr. Skoglund, staff. Lab. 4 cr.

402. HORSEMANSHIP
For beginning, intermediate, and advanced riders. Basics of balance seat, specializing in basic dressage and combined training. Limited number of students may stable their horses at the University. A fee is charged. Ms. Briggs, staff. May be repeated for a maximum of 12 credits. 2 cr.

404. INTRODUCTION TO LIGHT HORSE SCIENCE
Breeds, feeding, genetics, stable management, diseases, and other aspects of the light horse science field. Mr. Berndtson, staff. Lab. 4 cr.

501. ANIMAL ANATOMY AND PHYSIOLOGY
General anatomy and physiology of domestic animals and birds. Mr. Hylton and Mr. Berndtson. 4 cr.

502. FUNDAMENTALS OF ANIMAL HEALTH
Principles of disease mechanisms: causes, body reactions, and immunology. Prerequisite for other AnSc disease courses. Mr. Hylton, Mr. Moore. 2 cr.

503. ABATTOIR MANAGEMENT
Licensing requirements, sanitation, inspection facilities, and use of the slaughterhouse; field trips. Prereq: permission. Mr. G. L. Smith, Mr. Barney. Lab. 2 cr.

504. MEAT AND ITS PRODUCTS
Slaughtering, cutting, and identification of beef, lamb, pork, and poultry; field trips. Mr. G. L. Smith, Lab. 4 cr.

506. PRINCIPLES OF NUTRITION
Principles underlying nutrition of humans and animals; digestion, absorption, intermediate metabolism, and excretion of nutrients; function of nutrients in maintenance, growth, and production; metabolic disorders resulting from inappropriate intake of nutrients and diseases. Prereq: 1 year of chemistry; 1 semester of physiology. Mr. Parsons, Mr. Schwab. Lab. (Also offered as HEc 506.) 4 cr.

507. THE SCIENTIFIC APPROACH TO EQUINE DISCIPLINE
Physiological development, control, and education; bitting, longeing, driving and equine gymnastics. Prereq: AnSc 402 or equivalent; permission. Ms. Briggs. Lab. 2 cr.

508, 509. ANIMAL MANAGEMENT CLINIC
Instruction in field situations for AnSc and pre-vet majors; experience in animal management techniques and procedures. 508, Dairy and Livestock; 509, Light Horses. Prereq: permission. Mr. Barney, Mr. Berndtson, and staff. May be repeated. 2 cr. Cr/F.

601-602. ANIMAL SELECTION
Principles of selection based on production performance, pedigree, and type evaluation. 601-1. Livestock, Mr. Barney; 602-2. Dairy, Mr. Fairchild. 602-3. Light Horses, Ms. Briggs. Prereq: permission. May be repeated. Lab. 2 cr.

603. APPLIED ANIMAL NUTRITION
Application of scientific principles of nutrition to feed formulation and feeding systems for poultry and livestock. Mr. G. L. Smith, staff. Lab. 4 cr.

606. EQUINE DISEASES AND PARASITES
Common veterinary problems of horses, including infectious diseases, colic, parasites, and lameness. Prereq: AnSc 502. Mr. Hylton. 2 cr.

607. SMALL ANIMAL DISEASES
Common diseases in companion animals; emphasis on canine and feline medicine. Prereq: AnSc 502. Mr. Stackhouse, Mr. Moore. 2 cr.

609. LIVESTOCK DISEASES
Common veterinary problems of dairy and beef cattle, sheep, and swine. Prereq: AnSc 502. Mr. Hylton. 2 cr.

614. DISEASES AND PARASITES OF WILDLIFE
An ecological approach to some of the more common diseases and parasites of fishes, birds, game, and fur-bearing mammals. Influence of environment and management practices on the incidence and severity of diseases; relationship of wildlife diseases to human health. Prereq: permission. Mr. Strout. 3 cr.

616. EQUINE PODOLOGY
Structure and function of the appendicular skeleton; conformation of each segment of normal and abnormal limbs. Staff. Lab. 4 cr. (Not offered every year.)

617. LIVESTOCK CLINIC
Disease principles applied to clinical cases in the University herds and flocks; practical treatments and methods. Should be taken concurrently with AnSc 609. Prereq: AnSc 502 and permission. Mr. Hylton. 2 cr.

618. LIGHT HORSE CLINIC
Disease principles applied to clinical cases in the University herd. Should be taken concurrently with AnSc 606. Prereq: AnSc 502 and permission. Mr. Hylton. 2 cr.

651-652. MANAGEMENT OF DOMESTIC ANIMALS
Economic and management factors of the production of various economic species. Students may select any or all of the following specialized areas: 651-1. Light Horse, Mr. Gaiser; 651-2. Dairy, Mr. Fairchild; 652-3. Livestock, Mr. G. L. Smith; 652-4. Poultry, Mr. Skoglund. Prereq: permission. Lab. 4 cr. (Some sections offered on alternate year basis.)

653-654. PRINCIPLES OF TEACHING EQUITATION
Teaching techniques and procedures, with emphasis on dressage; opportunity to teach riding theory and techniques to other students under supervision of instructor. Teaching certificate awarded to students successfully completing course. Prereq: AnSc 402, 507, and 651-1; permission. A fee is charged. Ms. Briggs. Lab. A year-long course; 4 cr. each semester. Successful completion of both semesters is required for teacher certification.

697. ANIMAL SCIENCE SEMINAR
Survey: recent literature and research. Staff. 2 cr.

701. PHYSIOLOGY OF REPRODUCTION
Comparative aspects of embryology, anatomy, endocrinology, and physiology of reproduction. Mr. Condon. Lab. 4 cr.

702. EXPERIMENTAL ENDOCRINOLOGY OF REPRODUCTION
Discussions of current research literature plus application of laboratory techniques to the study of hormone relationships in the reproductive system. Prereq: AnSc 701 and permission. Mr. Condon. Lab. 4 cr.

704. PRINCIPLES OF PATHOBIOLOGY
Principles of disease processes; reactivity of the diseased cell, tissue, and organ. Prereq: AnSc 501, 502, and a 600-level disease course; /or permission. Mr. Stackhouse. 3 cr.

709. BIOCHEMISTRY OF NUTRITION
Intermediary metabolism of nutrients and energy; metabolism transport mechanisms; biological oxidations; interrelationships of carbohydrate, fat, and protein metabolism; obesity; control of hunger and appetite. Prereq: college course in biochemistry. Mr. Parsons. Lab. (Also offered as HEc 709.) 4 cr.

710. RUMINANT NUTRITION
Feeding and related management of ruminant animals with special emphasis on dairy cattle; nutrients and their use, digestive anatomy and physiology, energy systems, forage systems and quality, ration balancing, metabolic disorders, feeding for economical milk production and feeding young stock. Prereq: AnSc 506 or 603 or permission. Mr. Holter. 4 cr.

711. COMPARATIVE ANIMAL GENETICS
How heredity affects domestic animals, poultry, other mammals, and fish; emphasis on the organism and population. Quantitative inheritance; principles of selection; disease resistance; statistical and experimental techniques. Prereq: 4 cr. of genetics; /or permission. Mr. Collins. Lab. 4 cr.

712. ANIMAL BREEDING AND IMPROVEMENT
Population genetics and selection, with emphasis on the application of these principles to effect genetic improvement in dairy cattle and livestock. Prereq: permission. Mr. Fairchild. 4 cr. (Offered 1981-82 and alternate years.)

714. INTRODUCTION TO ELECTRON MICROSCOPY
Principles, theory, and methods used in preparing and examining vertebrate tissues in transmission and scanning electron microscopes. Interpretation of electron micrographs. Prereq: general chemistry; permission. Ms. Darr. 3 cr.

715. INTRODUCTION TO ELECTRON MICROSCOPY LAB
Application of principles and theories presented in AnSc 714. Fixation embedding ultramicrotomy, critical point drying operation of transmission and scanning electron microscopes and photographic procedures. Coreq: AnSc 714. Permission. Ms. Darr. 2 cr.

795, 796. INVESTIGATIONS IN DAIRY, LIVESTOCK, POULTRY
Problems in: 1) Genetics-G. L. Smith, Collins, Fairchild; 2) Nutrition-G. L. Smith, Schwab, Holter, Parsons; 3) Management-G.L. Smith, Skoglund; 4) Diseases-Dunlop, Hylton, Strout, S. C. Smith, Stackhouse, Darr, Moore; 5) Products-G. L. Smith; 6) Light Horsemanship-Briggs, Gaiser, Berndtson; 7) Physiology-Condon, Berndtson. Prereq: permission. May be repeated. 1-4 cr.

Anthropology

(See Sociology and Anthropology)

The Arts (Arts)

CHAIRPERSON: Arthur E. Balderacchi
PROFESSORS: George R. Thomas, emeritus; Sigmund M. Abeles, John W. Hatch, John L. Laurent, Melvin J. Zabarsky
ASSOCIATE PROFESSORS: Arthur E. Balderacchi, F. Conley Harris, Richard D. Merritt, Maryse P. Searls, Winifred C. Shaw, Daniel L. Valenza
ASSISTANT PROFESSORS: David S. Andrew, Margot Clark, Michael McConnell, David R. Smith, Mara R. Witzling
ADJUNCT ASSISTANT PROFESSOR: Susan Faxon Olney
VISITING LECTURERS: William Scarlato, Janis Theodore

Courses in the Department of the Arts are designed to support two degree programs: B.A. and B.F.A.

Two-Dimensional Courses

All courses elective by permission of the Department of the Arts.

432. DRAWING I
Lab. 4 cr.

532. DRAWING II
Prereq: Arts 432. Lab. 4 cr.

533. DRAWING III
Prereq: Arts 532. Lab. 4 cr.

534. DRAWING IV
Prereq: Arts 533. Lab. 4 cr.

The above courses are sequential drawing experiences, from the basic elements of line, form, space, etc., in various drawing media, concentrating on still-life and figure, and leading to conceptual exercises with emphasis on the individual's drawing development.

455. INTRODUCTION TO ARCHITECTURE
Study of architectural graphics, design theories, form determinants, and the architect in society. Course includes case study projects. Lab. 4 cr.

536. INTRODUCTORY PRINTMAKING
Graphic arts in a range of media. Prereq: Arts 532. Lab. 4 cr.

542. OIL PAINTING I
Prereq: Arts 432. Lab. 4 cr.

547. OIL PAINTING II
Prereq: Arts 542 or 544. Lab. 4 cr.

96

548. OIL PAINTING III
Prereq: Arts 547. Lab. 4 cr.

643. OIL PAINTING IV
Prereq: Arts 548 or 645. Lab. 4 cr.

644. OIL PAINTING V
Prereq: Arts 643. Lab. 4 cr.

The above courses are sequential painting experiences. Aspects of composition, color, and conceptualization.

544. WATER MEDIA I
Transparent and opaque water color. Prereq: Arts 532 or 542. Lab. 4 cr.

551. PHOTOGRAPHY I
Theory and practice of black-and-white creative photography. Students should provide their own cameras. Lab. 4 cr.

598. SOPHOMORE SEMINAR
Encourages experimentation by integrating verbal and plastic understandings through readings, discussions, studio work. Field trips. Prereq: 2 art history courses and 2 studio arts courses. 4 cr.

636, 637. PRINTMAKING WORKSHOP
Prereq: Arts 536. Lab. 4 cr.

645. WATER MEDIA II
Continuation of Arts 544; introduction to other water-based media. Prereq: Arts 544 or 547. Lab. 4 cr.

651. PHOTOGRAPHY II
Theory and practice of creative color photography. Camera and laboratory manipulative methods in black and white and/or color. Students should provide their own cameras. Prereq: Arts 551. Lab. 4 cr.

695. SPECIAL PROBLEMS IN THE VISUAL ARTS
See description under Three-Dimensional Courses.

751. PHOTOGRAPHY III
Application of new materials and methods. Students should provide their own cameras. Prereq: Arts 651. Lab. 4 cr.

796. INDEPENDENT STUDY IN THE VISUAL ARTS
A) Photography; B) Sculpture; C) Drawing; D) Painting; E) Graphics; F) Water Media; G) Architectural Design; H) Curatorial Assistant; I) Art History; J) Ceramics; K) Jewelry and Metalsmithing; L) Weaving; M) Wood Design. Open to highly qualified juniors and seniors. Prereq: permission of department chairperson and supervising faculty member or members. May be repeated to a total of 8 cr. 1-8 cr.

798. SEMINAR/SENIOR THESIS
Readings and discussions oriented toward the intellectual premises of art. Culminates in mounting an exhibition of the student's work. Required of all students in the B.F.A. program. Other advanced students may elect with instructor's permission. A year-long course; an "IA" grade (continuing course) will be given at the end of the first semester. Lab. 8 cr.

Three-Dimensional Courses

All courses elective by permission of the Department of the Arts.

501. CERAMICS I
Principles and materials of ceramics. Prereq: Arts 432. Lab. 4 cr.

513. JEWELRY AND METALSMITHING I
Principles and materials of jewelry and metalsmithing. Lab. 4 cr.

519. WEAVING I
Principles and materials of weaving. Lab. 4 cr.

525. WOODWORKING
Principles and materials of woodworking. Prereq: Arts 431 or 432 or 455. Lab. 4 cr.

567. SCULPTURE I
Principles and materials of sculpture. Prereq: Arts 432. Lab. 4 cr.

598. SOPHOMORE SEMINAR
See description under Two-Dimensional Courses.

601, 602. CERAMICS II AND III
Studio research into technical and aesthetic solutions of contemporary problems. Prereq: Arts 501. Lab. 4 cr.

613, 614. JEWELRY AND METALSMITHING II AND III
Design and construction of small-scale objects. Prereq: Arts 513. Lab. 4 cr.

619, 620. WEAVING II AND III
Four- and eight-harness weaves; double weave and 3-D fiber constructions. Prereq: Arts 519. Lab. 4 cr.

625, 626. WOOD/FURNITURE DESIGN
Studio design and construction of major furniture forms. Prereq: Arts 525. Lab. 4 cr.

668, 669. SCULPTURE II AND III
Studio research into technical and aesthetic solutions of contemporary problems. Prereq: Arts 567. Lab. 4 cr.

695. SPECIAL PROBLEMS IN THE VISUAL ARTS
Topics and prerequisites to be announced before preregistration. May be repeated with permission of the instructor. Lab. 4 cr.

701. CLAY AND GLAZE FORMULATION
Prereq: Arts 601 and 602. Lab. 4 cr.

725. WOOD/ENVIRONMENTAL DESIGN
Topic announced before preregistration. Prereq: Arts 625, 626. Lab. 4 cr.

767. CASTING
Study with cast bronze and aluminum sculpture. Prereq: two 600-level studio courses in the 3-D discipline. Lab. 4 cr.

768. SCULPTURE IV
Advanced studio research. Individual criticism. Prereq: Arts 668, 669, 767. Arranged. 4 cr.

See also Arts 796 and 798.

History of Art Courses

Exemption from prerequisites by permission of instructor.

431. VISUAL STUDIES
Appreciation and understanding of the visual arts. Works from variety of periods; emphasis on style, formal analysis, methods and materials of production. For freshmen and sophomores; open to juniors and seniors by permission. 4 cr.

480. ART OF THE ANCIENT WORLD
The chief and representative monuments in architecture, sculpture, and painting from Paleolithic times to the late Roman Empire. The history of art from a broadly humanistic perspective with investigation of works such as Stonehenge, the pyramids at Giza, Mesopotamian votive figures, the Parthenon and its sculptures, and illusionistic Roman frescoes at Pompeii. No prerequisites. 4 cr.

481. ART OF THE MIDDLE AGES
The chief and representative monuments in architecture, sculpture, and painting from early Christian times to the Gothic era. The history of art from a broadly humanistic perspective with investigation of works such as the Constantinian basilicas, Byzantine mosaics, the *Lindisfarne Gospels*, the portal sculpture of Autun, and Chartres cathedral. 4 cr.

482. ART OF THE AGE OF HUMANISM
The chief and representative monuments in architecture, sculpture, and painting from the early Florentine Renaissance to the courtly era of Louis XVI. The history of art from a broadly humanistic perspective with investigation of works such as Masaccio's frescoes, Michelangelo's *David*, the Ghent Altar, the basilica of St. Peter's, Rembrandt's self-portraits, and the Georgian house in Portsmouth. 4 cr.

483. ART OF THE MODERN WORLD
The chief and representative monuments in painting, sculpture, and architecture from the Age of Reason to the present. The history of art from a broadly humanistic perspective with investigation of works such as David's revolutionary paintings, Monet's *Water Lilies*, Picasso's *Guernica*, Pollock's drip paintings, Sullivan's skyscrapers, and Rodin's *Gates of Hell*. 4 cr.

484. GREAT ARTISTS AND MONUMENTS
A concentrated investigation of a small number of important works selected from the entire history of art. The history of art from a broadly humanistic perspective with investigation of such varied works as Michelangelo's *David* and van Gogh's *Starry Night*. 4 cr.

485. ARCHITECTURAL HISTORY
A survey of the chief and representative buildings from the entire history of architecture. Analysis of buildings with regard to structure, form, and symbolic content, concentrating on major works such as the pyramids, the Roman Pantheon, the Gothic cathedral, the Renaissance palace, the Baroque church, and the modern skyscraper. 4 cr.

486. STUDIES IN SCULPTURE
A survey of selected representative works from the entire history of sculpture. Analysis of the structure, materials, form, and symbolic content of relief and free-standing sculpture, including works such as the Egyptian pharaonic portraits, the sculptural program of the Athenian Parthenon, the portal of Autun, Michelangelo's *Slaves*, Bernini's mythological figures, Rodin's *Thinker*, and Oldenburg's *Soft Fan*. 4 cr.

575. GREEK AND ROMAN ART
Art and architecture in ancient Greece and Rome from about 1500 B.C. through the fourth century A.D. Emphasis on classical Greek art of the fifth century B.C. and Roman Imperial art of the first and second centuries A.D. Prereq: two 400-level art history courses. 4 cr.

577. EARLY MEDIEVAL ART
The development of Christian art to include early Christian art, Byzantine art in the East and West, Coptic art, and Christian art in northern Europe to the 11th century. Architecture, painting, sculpture, and the minor arts. Prereq: two 400-level art history courses. 4 cr.

578. ROMANESQUE AND GOTHIC ART
Art in western Europe from the 11th to the 15th century: architecture, sculpture, painting, and the minor arts. Prereq: two 400-level art history courses. 4 cr.

580. NORTHERN RENAISSANCE ART
Painting, sculpture, and graphic arts in France, Germany, Austria, and the Lowlands from the 14th through the 16th century. Prereq: two 400-level art history courses. 4 cr.

582. ITALIAN RENAISSANCE ART I
Painting, sculpture, and architecture in Italy during the fourteenth and fifteenth centuries. The emergence of Renaissance style in the art of such masters as Giotto, Masaccio, Donatello, Bellini, and Piero della Francesca. Attention is also given to the broad cultural developments to which they belong. Prereq: two 400-level art history courses. 4 cr.

583. ITALIAN RENAISSANCE ART II
Continuation of Arts 582. Primary focus is on the formation of High Renaissance classicism in the art of Leonardo, Michelangelo, Raphael, Bramante, and Titian. Attention is also given to the subsequent crisis of the classical ideal in sixteenth-century Mannerism. Prereq: two 400-level art history courses. 4 cr.

585. BAROQUE ART IN SOUTHERN EUROPE
Painting, sculpture, and architecture in Italy, France, and Spain during the seventeenth century. Emphasis on the diverse and innovative character of art in this period of crisis between the Renaissance and the modern era. Intensive analysis of the works of such major masters as Bernini, Caravaggio, Poussin, and Velazquez. Prereq: two 400-level art history courses. 4 cr.

586. BAROQUE ART IN NORTHERN EUROPE
Dutch and Flemish painting in the seventeenth century. Examination of such major figures as Rubens, Rembrandt, Van Dyck, and Vermeer. Attention is also given to the development of the genres and to the many "little masters" who practiced them. Prereq: two 400-level art history courses. 4 cr.

588. 19TH-CENTURY PAINTING AND SCULPTURE
Principal developments from David to Cezanne. Prereq: two 400-level art history courses. 4 cr.

589. 20TH-CENTURY PAINTING AND SCULPTURE
Principal developments from the 1890s to the 1940s. Prereq: two 400-level art history courses. 4 cr.

593. AMERICAN ART
A chronological survey of painting and sculpture in the United States from the colonial period to the present. Prereq: two 400-level art history courses. 4 cr.

594. 17TH- AND 18TH-CENTURY AMERICAN ARCHITECTURE
Chief Colonial architectural styles and monuments; their relation to European antecedents. Field trips. Prereq: two 400-level art history courses. 4 cr.

595. EARLY MODERN ARCHITECTURE: REVOLUTION TO WORLD WAR I
Chief styles and monuments of American and European architecture from the "visionaries" (Ledoux, Latrobe, Jefferson) to the birth of the skyscraper and "nonhistorical" architecture. Unique American contribution to modern architectural thought. Field trips. Prereq: two 400-level art history courses. 4 cr.

596. CONTEMPORARY ARCHITECTURE: THE BUILDINGS OF OUR TIMES
Chief styles and monuments of American and European architecture from Frank Lloyd Wright and the International Style to the present. Field trips. Prereq: two 400-level art history courses. 4 cr.

597. INTRODUCTION TO NON-WESTERN ART
Origins of art in prehistory. Evolution of pictorial and sculptural images in primitive cultures and the Orient; concentration on the development of pictorial art in China and Japan. 4 cr. (Not offered every year.)

689. ART SINCE 1945
Tentative history of the very contemporary painting and sculpture of the New York-to-Paris art scene. Prereq: Arts 589. 4 cr.

695. SPECIAL PROBLEMS IN THE VISUAL ARTS
See description under Three-Dimensional courses.

98

696. METHODS OF ART HISTORY
Essential bibliography and the methodology of research; the variety of approaches to art historical scholarship. Readings, discussion, and projects in connoisseurship, iconography, historiography, and museology. Prereq (for non-art history majors): permission. 4 cr.

698. SEMINAR IN ART HISTORY
Topics and prerequisites to be announced before preregistration. May be repeated with permission of instructor. 4 cr.

699. MUSEUM STUDIES
Introduction to museum practices. History of museums: their purposes, organization, interpretation, policies, and procedures. Use of University Art Galleries, visits to other museums, lecturers. Prereq: two courses in art history and permission. 4 cr.

See Arts 796.

Art Education Courses

All courses elective by permission of the Department of the Arts.

791. ART EDUCATION
Philosophy, objectives, and methods of the teaching of the visual arts, grades K-12. Lab. 4 cr.

See also Arts 796.

Biochemistry (Bchm)

CHAIRPERSON: James A. Stewart
PROFESSORS: Stanley R. Shimer, emeritus; Donald M. Green, Edward J. Herbst, Miyoshi Ikawa, Gerald L. Klippenstein, Samuel C. Smith, James A. Stewart, Arthur E. Teeri

402. BIOCHEMISTRY AND MAN
Of interest to all students; examines the biochemical principles man uses to modify his environment and existence, and the biochemical basis of disease treatment and prevention, nutrition, industrial processing, food manufacturing, and pollution and its control. Mr. Green. Prereq: secondary-school-level general chemistry. 4 cr.

501. BIOLOGICAL CHEMISTRY
Includes an introduction to organic chemistry. Prereq: one semester of chemistry or equivalent. Students receiving credit for Bchm 501 may not receive credit for Bchm 601. Mr. Teeri. Lab. 4 cr.

601. GENERAL BIOCHEMISTRY
General principles. Prereq: organic chemistry. Students receiving credit for Bchm 601 may not receive credit for Bchm 501. Mr. Ikawa. Lab. 4 cr.

656. PHYSIOLOGICAL CHEMISTRY AND NUTRITION
Mammalian biochemistry with emphasis on the human. Lab study includes procedures basic to chemical methods of medical diagnosis. Prereq: organic chemistry. Mr. Teeri. Lab. 4 cr.

699. SENIOR THESIS
Research in biochemistry for senior majors. 2 cr.

702. COMPARATIVE MARINE BIOCHEMISTRY
Nutrition, metabolism, and composition of marine organisms and relation to phylogeny; marine natural products. Mr. Ikawa. Prereq: Bchm 601 or equivalent. 3 cr. (Alternate years, offered 1981-82.)

721. NEUROCHEMISTRY
Biochemistry of the nervous system; metabolism and alterations of normal brain chemistry by drugs, chemicals, nutrition, memory, and learning; pathological changes. Mr. Stewart. Prereq: a biochemistry course. 3 cr. (Alternate years, offered 1980-81.)

751-752. PRINCIPLES OF BIOCHEMISTRY
Fundamental biochemistry; chemistry, metabolism, and biological function of nucleic acids, proteins, carbohydrates, and lipids. Prereq: organic chemistry or permission. Mr. Klippenstein and Mr. Stewart. Lab. 4 cr.

760. ENZYME CHEMISTRY
Structure, properties, and function of enzymes; kinetics and mechanisms of enzyme-catalyzed reactions; purification, characterization, and assay of enzymes. Mr. Klippenstein. Prereq: Bchm 601 or 751. Lab. 4 cr. (Alternate years, offered 1980-81.)

770. BIOCHEMICAL GENETICS
Mechanisms of storage, replication, transmission, transcription, recombination, mutation, and expression of genetic information by cells and viruses. Mr. Green. Prereq: Bchm 751 or permission. Lab. 4 cr. (Alternate years, offered 1981-82.)

781. THE NUCLEIC ACIDS
Chemistry and metabolism of nucleic acids; molecular structures, purification and separation, biosynthesis, and biological functions. Mr. Herbst. Prereq: organic chemistry; biochemistry. 3 cr.

795, 796. INVESTIGATIONS IN BIOCHEMISTRY
Prereq: permission. Subject matter and hours to be arranged. 2 cr.

Biology (Biol)

See additional course descriptions under Animal Sciences, Biochemistry, Botany, Entomology, Forest Resources, Microbiology, Plant Science, and Zoology.

401. HUMAN BIOLOGY
Elementary study of structure, function, and development of all systems of the body. No credit toward major or minor. Cannot be taken for credit after Zool 507-508. 4 cr.

402. MAN AND HIS ENVIRONMENT
Basic interrelationships between organisms and populations and their environments; ecosystems; man's modification of his environment and its consequences. No credit toward a major or minor. Students with credit for Biol 541 cannot receive credit for Biol 402. 4 cr.

403. THE LIVING WORLD
General survey of plant and animal kingdoms; elementary principles of heredity, evolution, and ecology. No credit toward a major or minor. 4 cr.

409. HUMAN REPRODUCTIVE BIOLOGY
Aspects of human sexuality from anatomical, physiological, and other viewpoints. No credit toward a major or minor. 4 cr.

420. MAN, NATURE, AND DISEASE
Ecology of human disease; role of disease in history; biological, social, and economic problems involved in eradication and control. Particular attention to diseases that still account for serious sickness and mortality in overpopulated, underdeveloped countries. No credit toward a major or minor. 4 cr.

541. GENERAL ECOLOGY
Interrelationships between organisms and their physical environment; populations, communities, the ecosystem, energy flow. Prereq: introductory chemistry; Bot 411; Zool 412; /or equivalent. 4 cr.

543. FIELD ECOLOGY
Consideration of ecological principles by inquiry in natural habitats and in the laboratory. Prereq: Math 425, statistics, or equivalent; present or prior enrollment in Biol 541; permission. Lab. 2 cr.

791. PROBLEMS IN THE TEACHING OF HIGH SCHOOL BIOLOGY
Objectives and methods; selection and organization of materials, preparation of visual aids and other projects; use of field trips. Prereq: two years of biological science; permission. 4 cr.

Botany and Plant Pathology (Bot)

CHAIRPERSON: A. Linn Bogle
PROFESSORS: Stuart Dunn, emeritus; Charlotte G. Nast, emerita; Arthur C. Mathieson, Avery E. Rich, Richard W. Schreiber
ADJUNCT PROFESSOR: Alex L. Shigo
ASSOCIATE PROFESSORS: Alan L. Baker, Robert O. Blanchard, A. Linn Bogle, William E. MacHardy, Subhash C. Minocha
ASSISTANT PROFESSORS: Garrett E. Crow, Leland S. Jahnke, Russell S. Kinerson
ADJUNCT ASSISTANT PROFESSOR: Walter C. Shortle

411. GENERAL BOTANY
Introduction to plant biology. Evolution of structure and function in the plant kingdom. Equivalent to Bot 412. Cannot be taken for credit if credit received for Bot 412. $5 lab fee. Mr. Schreiber. Lab. 4 cr.

412. INTRODUCTORY BOTANY
All groups of plants; growth, development, and environmental responses. Equivalent to Bot 411. Cannot be taken for credit if credit received for Bot 411. $5 lab fee. Mr. Jahnke. Lab. 4 cr.

503. THE PLANT WORLD
Survey of the plant kingdom from an evolutionary point of view; from the bacteria to the flowering plants, tracing the evolution of form, structure, and function in, and the interrelationships of, the major plant groups. Prereq: Bot 411 or 412, or equivalent with permission. Mr. Bogle. Lab. 4 cr.

525. INTRODUCTION TO MARINE BOTANY
Life history, classification, and ecology of micro- and macroscopic marine plants, including phytoplankton, seaweed, and salt marsh plants, and the interactions between man and marine plant communities. Occasional Saturday morning field trips. Prereq: Bot 411 or 412; a semester of biology; /or permission. Staff. Lab. 4 cr. (Summer Session only.)

566. SYSTEMATIC BOTANY
Scientific basis of plant taxonomy and the identification and classification of major plant families, native trees, shrubs, and wild flowers. Prereq: one semester of biological science. Mr. Crow. Lab. 4 cr.

606. PLANT PHYSIOLOGY
Structure and function in higher plants: water relations, metabolism, growth, and development. Prereq: Bot 411, 412, 503, or PlSc 421; and one year of chemistry; /or permission. Mr. Minocha, Mr. Pollard. Lab. 4 cr.

658. PLANT ANATOMY
Anatomy of vascular plants, emphasizing structure and development of basic cell and tissue types, and of the major plant organs. Prereq: Bot 411 or 412 or 503. Mr. Bogle. Lab. 4 cr. (Alternate years, offered 1980-81.)

666. SUMMER FLORA OF NEW HAMPSHIRE
Study of the flora of New Hampshire with an in-depth look at the major vegetation types. Fieldwork will include trips to study flora of forests, dunes, salt marshes, swamps, bogs, lakes, ponds, streams, and alpine. Prereq: basic botany or permission. Staff. 4 cr. (Summer Session only.)

717. GENERAL LIMNOLOGY
Special relationships of freshwater organisms to the chemical, physical, and biological aspects of their environment; factors regulating their distribution; and the primary and secondary productivity of lakes. Prereq: Biol 541 or equivalent. Mr. Baker, Mr. Haney. 4 cr.

719. FIELD LIMNOLOGY
Principles of freshwater ecology, from a variety of habitats; the methods used to study lakes and interpret data. Occasional Saturday field trips. Prereq: prior or simultaneous enrollment in Bot 717; permission. Mr. Baker and Mr. Haney. Lab. 4 cr.

721. THE MICROSCOPIC ALGAE
Survey of phytoplankton and periphyton in local marine and freshwater habitats. Identification, systematics, and evolution. Class and individual collection trips. Prereq: Bot 411, 412, or 503. Mr. Baker. Lab. 4 cr.

722. MARINE PHYCOLOGY
Identification, classification, ecology, and life histories of the major groups of marine algae, particularly the benthonic marine algae of New England. Periodic field trips. Prereq: Bot 411, 412, or 503. Mr. Mathieson. Lab. 4 cr. (Alternate years, offered 1981-82.)

723. MARINE ALGAL ECOLOGY
Distribution, abundance, and growth of marine plants in relation to their environment. Scheduled field trips and an independent research project are required. Prereq: Bot 722 or Zool 715 or permission. Mr. Mathieson. Lab. 4 cr. (Alternate years, offered 1980-81.)

724. FRESHWATER ALGAL ECOLOGY
Survey of freshwater algal habitats; physiological explanation of advanced population models. Individual experimental projects. Prereq: Bot 717 or 721 or permission. Mr. Baker. 4 cr.

727. ALGAL PHYSIOLOGY
A survey of major topics in the physiology and biochemistry of marine and freshwater algae including: nutrition, metabolic pathways, reproductive physiology, storage and extracellular products, cell inclusions, growth and development. Prereq: plant physiology and introductory biochemistry or permission. Mr. Jahnke. 2 cr. (Alternate years, offered 1981-82.)

729. ALGAL PHYSIOLOGY LABORATORY
Useful laboratory techniques in studying the physiology of freshwater and marine algae. Experiments in nutrition, metabolism, pigment and enzyme analysis. Small research project required. Prereq: concurrent registration in Bot 727 and permission. Mr. Jahnke. 2 cr. (Alternate years, offered 1981-82.)

730. MORPHOGENESIS
Principles of differentiation; internal and external factors in cellular and organismic development. Prereq: Bot 606 or permission. Mr. Minocha. 4 cr. (Alternate years, offered 1980-81.)

732. CELL BIOLOGY
Structure, behavior, and development of cells; the cellular basis of heredity. Prereq: one year of biological science and chemistry. Mr. Schreiber. 4 cr.

741. ECOSYSTEM ANALYSIS
Ecosystem structure and function; energy flow and biochemical cycles. Computer simulations of natural ecosystems. Prereq: Biol 541 or permission. Mr. Kinerson. Lab. 4 cr.

742. PHYSIOLOGICAL ECOLOGY
Physiological responses of plants to the physical environment; photosynthesis, water relations, mass and energy flow. Prereq: Bot 606 or permission. Mr. Kinerson. Lab. 4 cr.

100

747. AQUATIC HIGHER PLANTS
Flowering plants and fern relatives found in and about bodies of water in the northeastern United States; extensive field and herbarium work, preparation techniques, and collections. Prereq: Bot 566. Mr. Crow. Lab. 4 cr. (Alternate years, offered 1980-81.)

751. PLANT PATHOLOGY
Nature, symptomatology, etiology, classification, and control of important plant diseases. Prereq: Bot 411 or 412, or equivalent. Mr. Rich. Lab. 4 cr.

752. MYCOLOGY
Parasitic and saprophytic fungi; growth, reproduction, and identification; preparation of pure cultures. Prereq: Bot 411 or 412, or equivalent. Mr. Blanchard. Lab. 4 cr. (Alternate years, offered 1980-81.)

753. FOREST AND SHADE TREE PATHOLOGY
Principles, symptomatology, etiology, and control of forest and shade tree diseases. Prereq: Bot 411 or 412, or equivalent. Mr. Blanchard. Lab. 4 cr.

754. PRINCIPLES OF PLANT DISEASE CONTROL
Epidemiology of plant diseases and relationships to cultural practices; resistant varieties; biological control and chemical control. Crop loss assessment; disease forecasting and disease pest management. Prereq: Bot 751 or 753. Mr. MacHardy. Lab. 4 cr. (Alternate years, offered 1982-83.)

761. PLANT GEOGRAPHY
Distribution of plants, a consideration of vegetation types and floras, and problems of endemism with emphasis on North America; major influential factors such as geologic, climatic, edaphic, and biotic. Four Saturday field trips. Prereq: Bot 566 or permission. Mr. Crow. 4 cr. (Alternate years, offered 1980-81.)

762. MORPHOLOGY OF THE VASCULAR PLANTS
Comparative form and structure of the major living and extinct groups; evolutionary modifications of the vegetative and reproductive organs, and the basic life history pattern. Prereq: Bot 503. Mr. Bogle. Lab 4 cr. (Alternate years, offered 1981-82.)

764. MICROTECHNIQUE
Methods of preserving cell and tissue structure, embedding, sectioning, and staining plant tissues, and an introduction to microscopy. Prereq: permission. Mr. Bogle. Lab. 4 cr. (Alternate years, offered 1980-81.)

795-796. INVESTIGATIONS IN:
A) Systematic Botany; B) Plant Physiology; C) Plant Pathology; D) Plant Anatomy; E) Plant Ecology; F) Mycology; G) Cell Biology; H) Phycology; I) Botanical Teaching; J) Morphology; K) Cell Physiology; L) Scientific Writing. Individual projects under faculty guidance. Elective only with permission. 2-4 cr.

Chemical Engineering (ChE)

CHAIRPERSON: Stephen S. T. Fan
PROFESSORS: Irvin Lavine, emeritus; Oswald T. Zimmerman, emeritus; Stephen S. T. Fan
ASSOCIATE PROFESSORS: Virendra K. Mathur, Gail D. Ulrich
ASSISTANT PROFESSORS: Ihab H. Farag, Donald C. Sundberg

410. SURVEY OF CURRENT ENERGY AND POLLUTION ISSUES
Energy supply in this country and the world; conventional fuel reserves: coal, oil, natural gas; alternative sources: nuclear, solar, geothermal, etc. Forecasts and strategies to meet needs. Environmental pollution, sources, and economic and environmental impacts. Methods for pollution control. Regulatory standards for environmental protection. Prereq: good background in high school chemistry. 4 cr.

501. INTRODUCTION TO CHEMICAL ENGINEERING I
Overview of the profession. Systems of units; material balances and chemical reactions; gas laws; phase phenomena. 3 cr.

502. INTRODUCTION TO CHEMICAL ENGINEERING II
Energy and material balances for simple and complex systems with and without chemical reactions. 3 cr.

601. FLUID MECHANICS AND UNIT OPERATIONS
Continuity, momentum, and energy equations; laminar and turbulent flow in pipes; rheology. Applications to flow in porous media, filtration, and fluidization. 3 cr.

602. HEAT TRANSFER AND UNIT OPERATIONS
Thermal properties of materials, steady-state and transient conduction and convection; radiation; applications to heat exchangers and process equipment. Lab. 3 cr.

603. APPLIED MATHEMATICS FOR CHEMICAL ENGINEERS
Mathematical modeling and analysis of chemical engineering problems. Analytical methods for first- and second-order differential equations; numerical solutions; series solutions; Bessel functions; Laplace transforms; matrix algebra. Interpretation and solution of partial differential equations. Prereq: knowledge of FORTRAN programming. Lab. 4 cr.

604. CHEMICAL ENGINEERING THERMODYNAMICS
Volumetric and phase behavior of ideal and real gases and liquids; cycles; steady-flow processes; chemical equilibrium. Lab. 4 cr.

605. MASS TRANSFER AND STAGEWISE OPERATIONS
Diffusion in gases, liquids, and solids; design and analysis of distillation, absorption, adsorption, extraction, and other stagewise equipment and operations. 3 cr.

606. CHEMICAL ENGINEERING KINETICS
Use of laboratory data to design commercial reactors. Continuous, batch, plug-flow, and stirred-tank reactors for homogeneous and catalytic multiphase reactions. 3 cr.

608. CHEMICAL ENGINEERING DESIGN
Introduction to cost engineering. Application of acquired skills to design of chemical processes. Individual, major design project required. Lab. 4 cr.

609. FUNDAMENTALS OF AIR POLLUTION AND ITS CONTROL
Sources, pollutant transfer, and effects. Regulatory, administrative, legal, and social aspects; engineering control. 4 cr.

612. CHEMICAL ENGINEERING LABORATORY I
Selected experiments in fluid mechanics, heat transfer, and unit operations. 2 cr.

613. CHEMICAL ENGINEERING LABORATORY II
Selected experiments in mass transfer, stagewise operations, thermodynamics, and kinetics. 2 cr.

695. CHEMICAL ENGINEERING PROJECT
Independent research problems carried out under faculty supervision. 2-4 cr.

696. INDEPENDENT STUDY
Prereq: permission of the adviser and department chairperson; granted only to students having superior scholastic achievement. 1-4 cr.

701. HIGH POLYMERS
Principles and practice of industrial methods of polymerization and processing. Physical and chemical testing of various polymers. Lab. 4 cr.

705. NATURAL AND SYNTHETIC FOSSIL FUELS
Study of U.S. and foreign reserves of coal, oil, and natural gas. Petroleum processing and refining. Coal, oil shale, and tar sand. Gasification and liquefaction of coal. Lab. 4 cr.

712. INTRODUCTION TO NUCLEAR ENGINEERING
Development of nuclear reactors; basic binding-energy physics; radioactivity; elements of nuclear reactor theory; engineering problems of heat transfer, fluid flow, materials selection, and shielding; environmental impacts. 4 cr.

751. PROCESS SIMULATION AND OPTIMIZATION
Techniques for computer-aided analysis of chemical processing systems. Development of mathematical models to describe process behavior. Application of optimization techniques. Prereq: a knowledge of FORTRAN programming. Lab. 4 cr.

752. PROCESS DYNAMICS AND CONTROL
Dynamic behavior of chemical engineering processes described by differential equations; feedback control concepts and techniques; stability and analysis. Lab. 4 cr.

772. PHYSICOCHEMICAL PROCESSES FOR WATER AND AIR QUALITY CONTROL
Origin and characterization of pollutants. Controls, including filtration, sedimentation, coagulation and flocculation, absorption and adsorption. Applied fluid mechanics, mass transfer, and kinetics. Thermal pollution, chemical treatment, oil spills on water, and aeration. Lab. 4 cr.

Chemistry (Chem)

CHAIRPERSON: Charles W. Owens
PROFESSORS: Albert F. Daggett, emeritus; Helmut M. Haendler, emeritus; Alexander R. Amell, Kenneth K. Andersen, N. Dennis Chasteen, Clarence L. Grant, Colin D. Hubbard, Paul R. Jones, James D. Morrison, Charles W. Owens, Frank L. Pilar, Albert K. Sawyer, J. John Uebel, James H. Weber, Charles M. Wheeler
ASSISTANT PROFESSORS: W. Rudolf Seitz, Gary R. Weisman, Edward H. Wong

***401-402. GENERAL CHEMISTRY**
Elementary, nonmathematical, broad view of chemistry, including laboratory work. For students who do not intend to take any other chemistry courses, students whose major department requires this course, and those interested in satisfying a science requirement. Cannot be used as a prerequisite for other chemistry courses without the permission of the chemistry department. Lab. 4 cr.

***403-404. GENERAL CHEMISTRY**
Fundamental laws and concepts presupposing a knowledge of algebra; nonmetals, metals, and their compounds. Theoretical principles illustrated by lecture-demonstrations; applications of chemistry in the professions. For students who plan to take further chemistry courses. Lab. 4 cr.

***405. INTRODUCTORY CHEMISTRY**
Basic principles; atomic structure, bonding, equilibria, and thermodynamics. First course for chemistry majors. Prereq: one year of high school chemistry. Cannot be taken for credit if credit received for Chem 403-404. Lab. 4 cr.

406. QUANTITATIVE ANALYSIS
Studies of pollution, environmental problems, and the more traditional professional work in chemistry rely heavily on a sound knowledge of analytical chemistry. Gravimetric and volumetric analysis, potentiometry, spectrophotometry, and selected separations methods. Prereq: Chem 404 or 405. Coreq: Chem 407. 3 cr.

407. QUANTITATIVE ANALYSIS LABORATORY
Gravimetric and volumetric analysis; chemical separations; potentiometry and spectrophotometry. Treatment of data, error analysis, and calculations of results. Coreq: Chem 406. 2 cr.

*Students may receive credit for only one course from 401, 403, and 405, and for only one course from 402, 404.

517. QUANTITATIVE ANALYSIS
For students planning careers in medicine, dentistry, plant and animal science, nursing, oceanography, and environmental science. Volumetric methods, separations, and instrumental methods. Prereq: Chem 404 or 405. Coreq: Chem 518. 3 cr.

518. QUANTITATIVE ANALYSIS LABORATORY
Volumetric methods with an emphasis on technique; separations; and selected instrumental methods such as potentiometry, spectrophotometry, atomic absorption, and gas chromatography. Coreq: Chem 517. 2 cr.

545. ORGANIC CHEMISTRY
Introductory study of carbon compounds for those who desire a brief terminal course. Prereq: Chem 404 or 405. Coreq: Chem 546. Students receiving credit for Chem 545 may not receive credit for Chem 402, 547-548, or 651-652. 3 cr.

546. ORGANIC CHEMISTRY LABORATORY
Must be taken concurrently with 545. 2 cr.

547-548. ORGANIC CHEMISTRY
Principal classes of organic compounds, aliphatic and aromatic; class reactions and structural theory. Intended primarily for chemistry and biochemistry majors. Prereq: Chem 404 or 405; /or permission. Coreq: Chem 549-550. Students receiving credit for Chem 547-548 may not receive credit for either Chem 545 or 651-652. 3 cr.

549-550. ORGANIC CHEMISTRY LABORATORY
Must be taken concurrently with 547-548. Lab. 2 cr.

651-652. ORGANIC CHEMISTRY
Principal classes of organic compounds, aliphatic and aromatic, class reactions and structural theory. Intended primarily for pre-healing arts, biological science, and health science students. Prereq: Chem 404 or 405; /or permission. Coreq: Chem 653-654. Students receiving credit for Chem 651-652 may not receive credit for either Chem 545 or 547-548. 3 cr.

653-654. ORGANIC CHEMISTRY LABORATORY
Must be taken concurrently with 651-652. 2 cr.

663. INTRODUCTORY RADIOCHEMICAL TECHNIQUES
Techniques and laboratory practice in the use of apparatus in many fields of science employing radiochemical operations. Prereq: general inorganic chemistry and general physics. Lab. 4 cr. (Not offered every year.)

102

683-684. PHYSICAL CHEMISTRY I, II
The properties of gases, liquids, and solids; thermochemistry and thermodynamics; solutions, chemical equilibria, reaction rates, conductance, and electromotive force. Prereq: Math 426; pre- or coreq: Phys 407 or 402. Undergraduates must register for 685-686 concurrently. 3 cr.

685-686. PHYSICAL CHEMISTRY LABORATORY
Measurement of thermodynamic properties, chemical kinetics, and methods of determining the structure of matter. Prereq: Math 426; pre- or coreq: Phys 407 or 402. Undergraduates must register for 683-684 concurrently. 2 cr.

696. INDEPENDENT STUDY
For exceptional students. Individual reading, writing, or laboratory work carried out under the tutelage of a faculty member. The course may be used to replace specific required courses in chemisty. Prereq: approval of the adviser and department chairperson. Credits to be arranged.

697. CHEMICAL LITERATURE
The chemistry library as a research tool. Prereq: Chem 548 or 652. 1 cr.

698. SEMINAR
Student reports on topics of interest. Prereq: Chem 548 or 652; Chem 684. 1 cr.

699. THESIS
Background and experimental investigation of a selected topic. For chemistry majors who have completed Chem 548, 762, 684. Required for B.S. chemistry majors. Strongly recommended for B.A. chemistry majors. (2.5 average or permission required.) Lab. A year-long course; 4 cr. each semester, 8 cr. total. "IA" grade (continuous course) given at the end of first semester. Withdrawal from course results in loss of credit.

708. RESEARCH TECHNIQUES
Lectures and laboratory to show experimental methods and interpretation of results. Topics include chromatography, data handling, nuclear magnetic resonance, mass spectrometry, elementary electronics, infrared and ultraviolet spectroscopy, experimental design, and X ray. 1-4 cr.

755. ADVANCED ORGANIC CHEMISTRY
Methods of synthesis and determination of structure, including stereochemistry of complex organic compounds. Prereq: Chem 548 or 652 or equivalent. Chem majors must register for 756 concurrently. 3 cr.

756. ADVANCED ORGANIC CHEMISTRY LABORATORY
Synthesis and structural determination of complex organic compounds, techniques for the separation, determination of purity, and identification of compounds by spectroscopic and chemical means. Must be taken concurrently with 755 by Chem majors. 2 cr.

762. INSTRUMENTAL METHODS OF CHEMICAL ANALYSIS
Theory, instrumentation, and application of methods such as atomic absorption, coulometry, emission spectrography, gas and liquid chromatography, polarography, potentiometry, IR and UV-VIS absorption spectrophotometry, and mass spectrometry to chemical analysis. Prereq: Chem 406 or 517; Chem 684 as a pre- or corequisite; /or permission. Coreq: Chem 763. 3 cr.

763. INSTRUMENTAL METHODS OF CHEMICAL ANALYSIS LABORATORY
Experimental parameters, error analysis, and applications of the methods covered in Chem 762. Coreq: Chem 762. 2 cr.

774. INORGANIC CHEMISTRY
Basic theoretical concepts and their applications to inorganic reactions and compounds. Prereq: Chem 683; Chem 684 pre- or corequisite; /or permission. Undergraduates must take 775 concurrently. 3 cr.

775. INORGANIC CHEMISTRY LABORATORY
Synthesis and characterization of inorganic compounds with an emphasis on techniques not taught in other laboratory courses. Undergraduates must take 774 concurrently. Lab. 2 cr.

776. PHYSICAL CHEMISTRY III
Quantum theory; spectroscopy; chemical bonding; statistical thermodynamics. Prereq: Chem 683-684. Lab. 4 cr.

778. CHEMISTRY OF LARGE MOLECULES
Basic chemistry of high-molecular-weight compounds, including synthetic polymers and substances occurring in living systems. Elementary aspects of the structures, syntheses, and properties of large molecules, and their roles in modern science, technology, and living systems. Prereq: one semester of organic chemistry. 4 cr.

Civil Engineering (CiE)

CHAIRPERSON: Paul L. Bishop
PROFESSORS: Charles O. Dawson, emeritus; Russell R. Skelton, emeritus; Tung-Ming Wang
ASSOCIATE PROFESSORS: Robert P. Vreeland, emeritus; Paul L. Bishop, Louis H. Klotz, Paul J. Ossenbruggen
ADJUNCT ASSOCIATE PROFESSOR: Gerald Batchelder
ASSISTANT PROFESSORS: Yen-hsi Chu, Pedro A. De Alba, Charles H. Goodspeed, David L. Gress, Gary W. Jaworski, John A. Olofsson, Jr.
ASSISTANT PROFESSOR: Robert P. Moynihan (Civil Technology)

400. CIVIL ENGINEERING LECTURES
Introduction to the profession; the civil engineer as a planner, builder, and problem solver; and the goals of the civil engineering curriculum. Lectures by faculty and visitors. Required of CiE freshmen; open to others by permission. 0 cr. Cr/F.

501. SURVEYING
For non–civil engineering students. Theory and use of tape, level, transit, and aerial photographs in making plane and topographic surveys; use of surveys as a basis for deeds, maps, construction, design, environmental studies; reports involving the use of land or other natural resources. Lab. 4 cr.

505. SURVEYING
Principles of land measurements by ground and photogrammetric methods. Application of error theory to planning and adjusting engineering surveys. Conformal mapping and its applications to state plane coordinate systems. Prereq: Math 425-426. Lab. 4 cr.

508. ENGINEERING GRAPHICS
Orthographic projection and fundamentals of descriptive geometry. Lab. 2 cr.

525. MECHANICS I
An introduction to statics. Two- and three-dimensional force systems, the concept of equilibrium, analysis of trusses and frames, centroids, bending moment and shear force diagrams, friction, and virtual work. Prereq: Math 425; Math 426; Phys 407. (Also offered as M E 525.) 3 cr.

526. MECHANICS II
An introduction to strength of materials. Analysis of members under torsion, axial, shear, and bending stresses; superposition of stresses; stability of columns. Prereq: CiE 525. (Also offered as M E 526.) 3 cr.

527. MECHANICS III
An introduction to particle and rigid body dynamics. Rectilinear and curvilinear motion, translation and rotation, momentum and impulse principles, and work-energy relationships. Prereq: CiE 525 or permission. (Also offered as M E 527.) 3 cr.

621. TRANSPORTATION PLANNING AND DESIGN
Determining public transportation needs. Planning; the comparison and evaluation of alternative system modifications. Analysis of impacts of transportation facilities. Geometric design and traffic capacity of highways. Prereq: CiE major or permission. 3 cr.

622. ENGINEERING MATERIALS
Structural properties and applications of the various materials used in civil engineering work, including steel, cement, mineral aggregates, concrete, timber, and bituminous materials. Micro-structure and properties of common metals, plastics, and ceramics. Prereq: CiE 526. Lab. 4 cr.

623. SYSTEMS ANALYSIS
Quantitative and economic techniques for optimum allocation of resources in planning and design of physical systems. Calculus methods for constrained and unconstrained optimization problems, linear programming, dynamic programming, and benefit/cost economics. Case studies illustrate techniques in analyzing construction, structural, environmental, and transportation engineering problems. Prereq: Math 527 or equivalent. 3 cr.

642. FLUID MECHANICS
Properties of fluids, fluid statics, continuity, momentum and energy equations, flow resistance. Measurement of fluids. Prereq: CiE 527. Lab. 4 cr.

643. INTRODUCTION TO ENVIRONMENTAL POLLUTION CONTROL
Environmental engineering; causes and consequences of environmental pollution. Water pollution, air pollution, solid waste management; thermal pollution, radiological health, and occupational health. Prereq: Chem 403. 3 cr.

644. WATER AND WASTEWATER ENGINEERING
Fundamental design concepts for operations and processes used in water treatment and water pollution control. Prereq: CiE 643. 3 cr.

665. SOIL MECHANICS
Soil classification and physical properties. Permeability, compressibility, bearing capacity, settlement, and shear resistance are related to the behavior of soils subjected to various loading conditions. Prereq: CiE 622. Lab. 4 cr.

681. STRUCTURAL ANALYSIS
Analytical stress and deflection analysis of determinate structures under static and moving load. Computer solution of beams and trusses by classical and matrix methods. Prereq: CiE 525-526. 4 cr.

682. STRUCTURAL DESIGN CONCEPTS
Structural synthesis and design; modeling concepts for analysis-design cycles by manual and computer approaches; development of design criteria; and general structural system behavior. Prereq: CiE 681. 4 cr.

685. INDETERMINATE STRUCTURES
Analysis of indeterminate structures; nonprismatic members subject to static and moving loads. Solution by classical, numerical, and computer-applied methods. Prereq: CiE 681.4 cr.

695. CIVIL ENGINEERING PROJECTS
Independent research, under faculty guidance, of a subject of particular interest to an individual or a small group. Prereq: approval of faculty member involved. 2-4 cr.

701. ADVANCED SURVEYING
Instrumental and analytical photogrammetry. Conformal mapping and its application to the state plane coordinate systems. Geodetic surveying. Error theory and its application to the planning and adjustment of surveys. Application of electronic computers to surveying calculations. Prereq: CiE 505. Lab. 4 cr.

711. COMMUNITY PLANNING
Student project course focusing on real community problems. Issues investigated include population growth, community needs, economic and legal problems. Land-use models, survey techniques, and economic evaluation methods. Prereq: senior standing; permission. A year-long course; 2 credits each semester. "IA" grade (continuous course) will be given at the end of the first semester. 4 cr.

714. CONTRACTS, SPECIFICATIONS, AND PROFESSIONAL RELATIONS
Essential elements and legal requirements of engineering contracts; purposes and content of specifications; professional conduct, relations, registration, and ethics. Construction planning and management; cost analysis based on quantity surveys and unit-cost methods. Prereq: permission. 3 cr.

721. PAVEMENT DESIGN
Flexible and rigid pavements and bases for highways, airports, and city streets; pavement selection, construction methods, materials, specifications, and engineering cost estimates. Prereq: CiE 665. 3 cr.

722. PROPERTIES AND PRODUCTION OF CONCRETE
Basic principles of hydraulic cements and mineral aggregates, and their interactions in the properties of plastic and hardened concrete; modifications through admixtures; production handling and placement problems; specifications; quality control and acceptance testing; lightweight, heavyweight, and other special concretes. Prereq: CiE 622 or permission. 3 cr.

723. BITUMINOUS MATERIALS AND MIXTURES
Considerations of major types of bituminous materials, asphalt cements, cutback asphalts, asphalt emulsions, and tars; influence of chemical composition on physical properties; desirable aggregate characteristics for bituminous mixtures; construction techniques; current practices for determining optimum asphalt contents. Prereq: CiE 622 or permission. 3 cr.

731. NETWORK PLANNING AND SCHEDULING
Application of critical path methods (CPM) and project evaluation review technique (PERT) to the design and control of engineering projects. Lab. 2 cr.

104

740. RURAL WASTEWATER ENGINEERING
Methods for collecting and treating wastewater in small communities and rural areas. Biological and physicochemical treatment systems for small communities; land application; soil absorption; gray water treatment; and septage treatment. Prereq: CiE 643. 3 cr.

741. OPEN CHANNEL FLOW
Energy and momentum principles in open channel flow; flow resistance; channel controls and transitions; unsteady open channel flows; convective and dispersive transportation of pollutants; and basic modeling techniques. Prereq: CiE 642. 3 cr.

743. ENVIRONMENTAL SAMPLING AND ANALYSIS
Laboratory exercises in the techniques of water, wastewater, and solid-waste sampling and analysis. Interpretation of results from pollution surveys and operation of pollution control facilities; statistics of sampling and statistical evaluation of analytical data. Prereq: Chem 403, 404. Lab. 2 cr.

744. ENVIRONMENTAL LIMNOLOGY
Biological, chemical, and physical lacustrine processes are interpreted from the engineering viewpoint. Basic concepts of lake trophic status are expanded and analyzed with emphasis on eutrophication processes. Laboratory and field work in a selected semester theme area and associated readings in the current scientific literature are required. Prereq: basic limnology, aquatic chemistry, or permission. Lab. 4 cr.

745. HYDROLOGY AND HYDRAULICS
Occurrence and physical effects of water on the earth; meteorology, groundwater runoff and stream-flow routing, open-channel flow, reservoirs, control works, hydroelectric power, irrigation, drainage, and multipurpose projects. Prereq: CiE 642. 3 cr.

746. WASTEWATER TREATMENT PLANT DESIGN
Choice of treatment units. Design of the components; preparation of a plan for a particular city that includes a suitable combination of the units previously designed. Prereq: CiE 644. 3 cr.

747. INTRODUCTION TO MARINE POLLUTION AND CONTROL
Introduction to the sources, effects, and control of pollutants in the marine environment. Dynamic and kinetic modeling; ocean disposal of on-shore wastes, shipboard wastes, solid wastes, dredge spoils, and radioactive wastes; and oil spills. Prereq: CiE 644 or permission. 3 cr.

748. SOLID WASTE DISPOSAL
Basic concepts and theory of collection and disposal systems. Design methods involved in disposal systems. Prereq: CiE 643 or permission. 3 cr.

749. CHEMISTRY OF NATURAL WATERS
Chemical equilibrium concepts applied to natural waters. Buffer systems; carbonate equilibria, acid-base equilibria. Chemical principles of water and wastewater treatment. Equilibrium modeling of natural waters and treatment processes. Water softening, phosphate removal, chemical precipitation. Prereq: Chem 403, 404. 3 cr.

751. TRANSPORTATION PLANNING
Transportion demand forecasting techniques applied to regional and urban situations. Calibration and use of mathematical models for forecasting land use, trip generation, trip distribution, model choice, and trip assignment. Prereq: Math 644. 3 cr.

752. TRAFFIC ENGINEERING
Statistical and probabilistic methods to analyze and design roadway facilities. Level of service and capacity analysis of roadways under uninterrupted and interrupted flow conditions. Queuing theory and simulation models, design of traffic facilities. Prereq: Math 644. 3 cr.

757. COASTAL ENGINEERING AND PROCESSES
Introduction to small amplitude and finite amplitude wave theories. Wave forecasting by significant wave method and wave spectrum method. Coastal processes and shoreline protection. Wave forces and wave structure interaction. Introduction to mathematical and physical modeling. Prereq: CiE 642 or permission. 3 cr.

763. ADVANCED SOIL MECHANICS I
Current methods of determining soil strength and compressibility. Application to earth pressure, bearing capacity, slope stability, and settlement problems. Prereq: CiE 665. 4 cr.

765. FOUNDATION ENGINEERING
Subsurface investigation, excavation problems. Selection of foundation type. Design of footings, rafts, pile foundations, bulkhead walls. Prereq: CiE 682; CiE 763. 4 cr.

768. SEEPAGE THROUGH EARTH STRUCTURES
Groundwater flow, Darcy's Law, flow nets, Dupuit's theory and application, conformal mapping techniques, confined flow, flow through earth and rock structures, seepage toward wells. Prereq: CiE 642 and 665. 2 cr.

782. TIMBER DESIGN
Properties and characteristics of structural woods, mechanics of wood, connection methods, design of timber members, and connections in beams, columns, and trusses, and glued laminates of wood. Prereq: CiE 682; permission. 2 cr.

784. STRUCTURAL ANALYSIS BY MATRIX AND NUMERICAL METHODS
Unifying concept of basic structural analysis theories; matrix and numerical methods of analysis, and their application by linear graph concepts using computers. Prereq: CiE 685. 4 cr.

785. INTRODUCTION TO STRUCTURAL VIBRATIONS
Dynamic analysis of single- and multi-degree-of-freedom systems. Simple beam and frame structures. Earthquake analysis and design. Co- or prereq: CiE 685. 3 cr.

790. INELASTIC STRUCTURAL DESIGN
Continuation of modern design theory; ultimate design of reinforced concrete; plastic analysis of steel structures. 4 cr.

793. STRUCTURAL DESIGN IN STEEL
The design of members and connections: tension and compression members, beams, plate girders; riveted, bolted, and welded joints. Introduction to plastic design of beams and frames. Prereq: CiE 682 or permission. 4 cr.

794. REINFORCED CONCRETE DESIGN
The design of reinforced concrete members by Strength Design Theory including beams, columns, beam-columns, and slabs for strength and deformations. Prereq: CiE 682. 4 cr.

795-796. INDEPENDENT STUDY
A limited number of qualified senior and graduate students will be permitted to pursue independent studies under faculty guidance. Seniors may write terminal theses reporting the results of their investigations. 1-4 cr.

Classics

(See Ancient and Modern Languages and Literatures)

Communication Disorders (Comm)

CHAIRPERSON: F. Harry Tokay
ASSOCIATE PROFESSORS: Frederick P. Murray, F. Harry Tokay
ASSISTANT PROFESSORS: Fred C. Lewis, Charles W. Martin
LECTURER: Yvonne Daniels

Comm 520 is a prerequisite for all courses in the department.

520. SURVEY OF COMMUNICATION DISORDERS
Causes, diagnosis, and treatment of speech, language, and hearing disorders. 4 cr.

521. ANATOMY AND PHYSIOLOGY OF THE SPEECH AND HEARING MECHANISMS
Anatomy, physiology, neurology, and function of the mechanisms for the production and perception of speech. 4 cr.

524. APPLIED PHONETICS OF AMERICAN ENGLISH
International Phonetic Alphabet; its practical application to speech therapy and/or the student's professional interest. 4 cr.

631. SPEECH PATHOLOGY I
Normal development of speech and language. Research and therapy procedures as applied to communication disorders, articulation, and voice. 4 cr.

632. SPEECH PATHOLOGY II
Diagnosis, therapy, and counseling procedure applied to communication disorders; emphasis on stuttering, cleft palate, cerebral palsy, and aphasia. Prereq: Comm 631 or permission. 4 cr.

634. CLINICAL PRACTICE IN SPEECH PATHOLOGY
Supervised experiences in diagnosis and therapy with speech-handicapped children and adults. Experiences with school-age children in individual and group therapy. Prereq: Comm 524 and 632. 4 cr. Cr/F.

638. THE ACQUISITION OF LANGUAGE
Review of research and theories in speech pathology, education, linguistics, and learning theory related to development of language in the normal child. 4 cr.

650. PRINCIPLES AND PRACTICE OF PUBLIC SCHOOL SPEECH THERAPY
Principles, goals, and philosophy of public school speech and language therapy. Supervised practicum. Prereq: Comm 634. Lab. 4 cr.

660. SPECIAL PROBLEMS IN COMMUNICATION DISORDERS
Individual or group projects to enrich or expand theoretical knowledge and to afford an opportunity for applied experience. Permission and arrangement with faculty. May be repeated to a maximum of 8 credits. 2, 4, 6, or 8 cr.

704. BASIC AUDIOLOGY
Normal hearing process and pathologies of the auditory system. Hearing screening, pure-tone testing, and speech audiometry. Prereq: Comm 521 or permission. 4 cr.

705. INTRODUCTION TO AUDITORY PERCEPTION AND AURAL REHABILITATION
Research, testing, and clinical procedures of auditory perception, applied to the communicatively impaired. Prereq: Comm 704; permission. 4 cr.

706. STUTTERING
Theoretical and therapeutic considerations of the stuttering syndrome; emphasis upon clinical management. Prereq: Comm 632 or permission. 4 cr.

780. SEMINAR IN DIAGNOSIS OF SPEECH AND LANGUAGE DISORDERS
Principles and practice for diagnosis of speech and language disorders; examination procedures and measurement techniques. Prereq: Comm 632. 4 cr.

795. INDEPENDENT STUDY
Application of the theory to specific communication disorder areas for individual or group projects. Prereq: permission. May be repeated to a maximum of 8 credits. 2, 4, 6, or 8 cr.

Community Development

(See Institute of Natural and Environmental Resources)

Computer Engineering

(See Electrical and Computer Engineering)

Computer Science

(See Mathematics and Computer Science)

Division of Continuing Education (DCE) Career Option Courses

DIRECTOR OF DIVISION OF CONTINUING EDUCATION: Edward J. Durnall

506, 606. FIELD EXPERIENCE
Supervised work experience with planned learning objectives relating to either the student's career option or the student's major area of concentration. Associate in Arts degree candidates and students with minors in career option fields should register for 506; students engaged in supervised work experience related to their baccalaureate area of concentration should register for 606. Prereq: permission. May be repeated to a maximum of 8 credits for A.A. degree students, 16 credits for baccalaureate degree students. 2-8 cr.

599. SPECIAL TOPICS
Occasional course offerings of specialized material in A.A. career options; general studies topics for nontraditional learners; travel/study programs. Prereq: permission. 1-4 cr.

Accounting

462-463. PRINCIPLES OF FINANCIAL ACCOUNTING
Two-semester sequence covering the principles of financial accounting. Double-entry, accrual accounting model and its application to service and merchandising firms. Accounting cycle, from the design of the system and the analysis of transactions to the final preparation of financial statements. 4 cr.

561. PRINCIPLES OF COST ACCOUNTING
Accounting for the flow of manufacturing costs in an industrial firm. Accounting for raw materials, direct labor and factory overhead, flow of costs in acquisition, work-in-progress, and finished goods to costs of goods sold. Job order and process cost systems, and concepts of standard and variance analysis. Prereq: DCE 462. 4 cr.

562. TAX PRINCIPLES AND PROCEDURES
Principles of federal, state, and local taxes; emphasis on federal income tax. Principles of taxation, tax planning, tax accounting, and the preparation of basic individual and business returns. New Hampshire and local taxes. Prereq: DCE 462. 4 cr.

563. PRINCIPLES OF MANAGERIAL ACCOUNTING
Need for and analysis of accounting data in the managerial planning and control process. Use of accounting information in the management of ongoing operations, in special nonrecurring decisions, and in long-range planning and capital budgeting. Prereq: DCE 462-463; DCE 561. 4 cr.

Banking

440. MONEY AND BANKING
American financial system. How money is created and affects economy. Monetary policy. Pre- or coreq: DCE 530 or Econ 401. Not open to students who have had Econ 635. 4 cr. (Not offered every year.)

441. BANK OPERATIONS
Cash management and control, clearing and collections operations, loan and deposit administration, internal audit, and ancillary services. Pre- or coreq: DCE 432 or 462. 4 cr. (Not offered every year.)

540. BANK INVESTMENTS
Investment and portfolio analysis in relation to bank operations; constraints affecting liquidity, safety, and profitability; types of securities; optional timing of investment transactions. Prereq: DCE 440. 4 cr. (Not offered every year.)

Craftsmanship (Stringed Instruments)

491. BASIC CRAFTSMANSHIP
Practices and procedures of maintenance of stringed instruments; artisan craft demonstrated and explained by a master craftsman. Prereq: permission. 1 cr.

492. INTERMEDIATE CRAFTSMANSHIP
Fundamental principles, techniques, and procedures in maintaining and repairing violins and other quality stringed instruments. Prereq: DCE 491; permission. 3 cr.

591. ADVANCED CRAFTSMANSHIP I
Artisan craft design and construction: applications and techniques of major repair to violins and quality stringed instruments. Interdisciplinary lectures, demonstrations, and supervised craftsmanship. Prereq: DCE 492; permission. 4 cr.

592. ADVANCED CRAFTSMANSHIP II
Continuation of DCE 591; emphasis on special problems in the repair of quality stringed instruments. Prereq: DCE 591; permission. 4 cr.

593. ADVANCED CRAFTSMANSHIP III
Continuation of DCE 592; emphasis on designed construction of new violins. Prereq: DCE 592; permission. 4 cr.

Criminal Justice

550. CRIMINAL JUSTICE ADMINISTRATION AND ORGANIZATION
Contemporary methods of administrative practice for efficient use of personnel, facilities, and equipment; planning and research; budgeting and control; decision making; communications. 4 cr. (Not offered every year.)

551. CRIME PREVENTION AND CONTROL
Coordinating the efforts of the community and criminal justice agencies. Problem solving in specific crime analysis—the offense, the offender, and community environment. 4 cr. (Not offered every year.)

552. CORRECTIONS TREATMENT AND CUSTODY
Scientific diagnosis and treatment of offenders. Institutional administration methods—climate, personnel, structure, and procedure. 4 cr. (Not offered every year.)

554. JUVENILE JUSTICE ADMINISTRATION AND ORGANIZATION
Techniques and methods of organizing and administering police juvenile units: role, function, and responsibilities of juvenile officers within the juvenile justice system. Prereq: permission. 4 cr. (Not offered every year.)

555. DELINQUENCY PREVENTION AND CONTROL
Causes of delinquency; pathogenic patterns; and diagnosis of child abuse. Prevention and treatment of child abuse and delinquency through coordination of the efforts of community and criminal justice agencies. Prereq: permission. 2 cr. (Not offered every year.)

Insurance

420. PRINCIPLES OF INSURANCE
History, ethics, and the theory of risk. Major types of insurance. Operation and administration of an agency. 4 cr.

421. LIFE AND HEALTH INSURANCE
Insurance programs for the individual. History; types of contracts; legal concepts; and government, group, and individual programs 4 cr. (Not offered every year.)

422. PROPERTY, LIABILITY, AND MARINE INSURANCE
Fire, casualty, transportation, marine, and aircraft insurance; fidelity and surety bonds; worker's compensation; underwriting, loss adjustment, and prevention; government regulations, rate making, and reinsurance. 4 cr. (Not offered every year.)

Library Science

401. INTRODUCTION TO LIBRARIES
History; role as a social institution; philosophy of library service; tools, techniques, and routines of library work. 4 cr. (Not offered every year.)

402. CLASSIFICATION
Dewey Decimal and Library of Congress classification systems; typing and filing cards; subject-heading theory and use; maintenance of shelf-list and other files. 4 cr. (Not offered every year.)

403. SUPPORT FOR PUBLIC SERVICES
Reference and bibliographic tools; philosophy of reference services; reference works in all types of libraries. 4 cr. (Not offered every year.)

501. NONBOOK MATERIALS AND SERVICES
Technical organization and operation of audio-visual materials, services, and equipment. 4 cr. (Not offered every year.)

502. ACQUISITION AND CIRCULATION SYSTEMS
Acquisition and processing of materials; the technical aspects of circulation systems. 4 cr. (Not offered every year.)

503. CHILDREN'S LIBRARY SERVICE
Materials for children; procedures and techniques for working with children; implementation of special programs; selection of materials; reference methods. 4 cr. (Not offered every year.)

Management

430. MANAGEMENT PRINCIPLES AND ORGANIZATION
Management philosophy and practices; organization, structure, communication, planning, controlling, and decision making. Not open to Admn or Hotl majors. 4 cr.

431. HUMAN BEHAVIOR AND SUPERVISION
Nature of people at work; leadership; informal organization; employee training and development; motivation, morale, and performance appraisal; and counseling for improvements. Can be offered as one-credit modules in: Human Relations and Motivation, Effective Supervision, Employee Training and Development, and Employee Relations. Career option students required to complete 431 must take 4 credits. Not open to Admn or Hotl majors. 1-4 cr.

432. PRINCIPLES OF ACCOUNTING
Sole proprietorship, partnership, and the corporation; recording, summarizing, and reporting data; systems to account for and control purchases, sales, cash, receivables, and inventory; valuation of assets and measurements of income. Not open to students who have had Admn 502 or DCE 462 or to A.A. degree candidates in accounting career option. 4 cr.

530. ECONOMICS
U.S. economy and its component units. Macro- and microeconomic perspectives. Not open to students who have had Econ 401 or 402, or REco 411. 4 cr.

531. SALESMANSHIP
Principles and techniques of personal selling; customer needs and satisfaction. 4 cr.

532. BUSINESS LAW
Legal theory, practice, and precedents in everyday business situations. Not open to students who have had Admn 647. 4 cr.

533. CREDIT MANAGEMENT
Credit—its effect on the money supply and its role in the economy; commercial and consumer borrowing; credit policy, analysis, and regulations; secured and unsecured credit; collections; receivables; management of credit; and decision making. 4 cr. (Not offered every year.)

534. SMALL BUSINESS MANAGEMENT ISSUES
The environment of small business. Topics include: financial planning and procedures for starting a small business; developing and establishing a marketing plan; operating a going business; franchising; and cash flow management. 4 cr. (Not offered every year.)

535. OFFICE PROCEDURES AND MANAGEMENT
Methods and procedures of traditional and modern administrative office operations; office systems, word processing, records management, staffing, and organization of work flow. 4 cr.

Merchandising

410. FUNDAMENTALS OF MERCHANDISING
Practices and procedures in marketing goods and services; retailing and wholesaling; channels of trade; functions of middlemen. Not open to Admn or Hotl majors. 4 cr. (Not offered every year.)

411. PROMOTION AND ADVERTISING
Mass communication in marketing; use of advertising media; integration of promotional plans and sales techniques; evaluation of promotional efforts. Not open to Admn or Hotl majors. 4 cr. (Not offered every year.)

510. RETAILING
Managing a goods or services retail enterprise; store location and organization, layout, buying and pricing, advertising and sales promotion, inventory control, and personnel policies. 4 cr. (Not offered every year.)

512. FASHION MERCHANDISING AND DISPLAY
Principles and procedures used in selection, promotion, and selling of fashion apparel and accessories. Analysis of principles of display. Prereq: DCE 410 or permission. 4 cr. (Not offered every year.)

Quality Control

480. FUNDAMENTALS OF QUALITY CONTROL
Planning, organizing, and admistering quality control operations in relation to company policy and objectives. 4 cr. (Not offered every year.)

580. QUALITY CONTROL ENGINEERING
Pre-process, in-process, and post-process control techniques. Data accumulation, classification, evaluation, measurement, reporting, and costs. Prereq: DCE 480 or permission. 4 cr. (Not offered every year.)

581. STATISTICAL APPLICATIONS TO QUALITY CONTROL
Tendency and variation, normal curve applications, histogram analysis, control charts, sampling plans, and Dodge-Romig and Military Standard Tables. Prereq: DCE 480 or permission. 4 cr. (Not offered every year.)

582. PROCUREMENT QUALITY CONTROL
Optimizing the quality of incoming materials and supplies. Quality specifications, receipt, source inspection, and vendor surveys and ratings. Prereq: DCE 480 or permission. 4 cr. (Not offered every year.)

Real Estate

425. FUNDAMENTALS OF REAL ESTATE
History and development of property ownership; title and legal processes; limitations and restrictions of rights, contracts, and agreements; deeds and transfer of property. 4 cr.

426. REAL ESTATE APPRAISAL
Principles of land and building analysis, cost estimation, depreciation, and influences affecting value of residential and commercial property. Prereq: DCE 425. 4 cr. (Not offered every year.)

525. REAL ESTATE LAW
Fundamentals of real estate law; nature and classes of property; ownership; purchase and sales; and rights, duties, and responsibilities of the broker. 4 cr.

526. REAL ESTATE FINANCE
Mortgages, loans, and financing residential and commercial property. 4 cr. (Not offered every year.)

Traffic and Distribution Management

470. INTRODUCTION TO TRANSPORTATION AND TRAFFIC MANAGEMENT
Characteristics and operations of the various modes and classes—common, contract, exempt, and private. Relationship between distribution management and other operational activities. 4 cr. (Not offered every year.)

471. CARRIER OPERATIONS
Principles of freight traffic; shipper-carrier relations. Terminal operations, freight handling, dispatching, inventory controls, employee relations, and other areas related to the operation of the transportation industry. 4 cr. (Not offered every year.)

570. PRINCIPLES OF PHYSICAL DISTRIBUTION
Elements involved in physical distribution and their interrelationships: inventory management, warehousing, industrial packaging, materials handling, physical flow, labor relations, cost control, forecasting. 4 cr. (Not offered every year.)

108

571. TRANSPORTATION REGULATIONS
Relationships among federal, state, and international regulatory agencies and the modes and classes of transportation. Interstate Commerce Act application and interpretation; handling and filing of claims; documentation; export-import regulations; safety requirements; and labor contracts. Prereq: DCE 470 or permission. 4 cr. (Not offered every year.)

Earth Sciences (ESci)

CHAIRPERSON: Herbert Tischler
PROFESSORS: Donald H. Chapman, emeritus; T. Ralph Meyers, emeritus; Henri E. Gaudette, Cecil J. Schneer, Herbert Tischler
ADJUNCT PROFESSOR: Robert I. Davis
ASSOCIATE PROFESSORS: Glenn W. Stewart, emeritus; Franz E. Anderson, Francis S. Birch, Wallace A. Bothner, Wendell S. Brown, Theodore C. Loder
ASSISTANT PROFESSORS: Jo Laird, Paul A. Mayewski

401. PRINCIPLES OF GEOLOGY I
The earth; earth materials (rocks and minerals), landforms, and the processes that form them (volcanism, earthquakes, glaciation, etc.). Field trips. Lab. 4 cr.

402. PRINCIPLES OF GEOLOGY II
The geological history of the earth: an interpretation of past geologic events emphasizing the geological development of North America and the evolution of life. Prereq: ESci 401. Lab. 4 cr.

409. ENVIRONMENTAL GEOLOGY
Environmental impact of geologic processes; natural hazards—landslides, earthquakes, volcanoes, flooding, erosion, and sedimentation; land exploitation and site investigations; environmental considerations of water-supply problems; the recovery of energy and mineral resources. Lab. Students may not receive credit for both ESci 401 and ESci 409. 4 cr.

501. INTRODUCTION TO OCEANOGRAPHY
Physical, chemical, geological, and biological processes in the sea. 4 cr.

502. INTRODUCTION TO OCEANOGRAPHY LABORATORY
Laboratory complements and expands upon ESci 501 lectures; registration for ESci 502 is optional. Navigation, tides, currents, waves, chemical and physical aspects of seawater, pollution, etc. Co- or prereq: ESci 501. 1 cr.

503. INTRODUCTION TO MARINE SCIENCE
Team-taught course under New Hampshire College and University Council (NHCUC). Physical, geological, chemical, and biological aspects of the oceans. Field trips. Saturday only. Prereq: permission. (No credit if completed ESci 501.) 4 cr.

512. DESCRIPTIVE AND DETERMINATIVE MINERALOGY
Physical and chemical properties of minerals; their associations; modes of occurrence; and uses; identification. Prereq: ESci 401; Chem 401 or 403. Lab. 4 cr.

531. STRUCTURAL GEOLOGY
Structural units of the earth's crust and mechanics of their formation. Prereq: ESci 402. Lab and fieldwork. 4 cr.

561. GEOMORPHOLOGY
Processes leading to the development of landforms. Field trips. Prereq: ESci 401. Lab. 4 cr.

595. SPECIAL PROJECT IN THE EARTH SCIENCES
A) Oceanography. 1-4 cr.

603. MARINE SCIENCE SUMMER INSTITUTE
Six-week institute of three course offerings in marine-oriented disciplines. Lectures, labs, field trips, plus two weeks of intensive field work at the Cobscook Bay Marine Science Station. Student takes two out of the three courses. Prereq: Approval of campus representative of the Marine Sciences Committee of the New Hampshire College and University Council. Not for major credit in earth sciences. May be repeated. 8 cr.

613. PRINCIPLES OF MINERALOGY
Crystallography; principles of the physics and chemistry of natural solids; atomic structures of minerals and their investigation by X-ray diffraction. Prereq: ESci 512. Lab. 4 cr.

614. PETROGRAPHY
Description and classification of igneous, sedimentary, and metamorphic rocks in hand specimen and thin section; optical mineralogy. Prereq: ESci 613. Lab. 4 cr.

652. INVERTEBRATE PALEONTOLOGY
Classification, evolution, and environmental and stratigraphic significance of invertebrate animals as recorded by fossils. Field trip to collect fossils and examine ancient environments. Prereq: ESci 402 or Zool 412; /or permission. Lab. 4 cr.

725. IGNEOUS AND METAMORPHIC PETROLOGY
Textural, mineralogical, and chemical analysis, and phase rule and phase diagram interpretation applied to petrogenesis. Prereq: ESci 614; /or permission. Lab. 4 cr.

732. GEOLOGIC MAPPING AND INTERPRETATION
Standard methods of geologic field mapping; interpretation of geologic maps and aerial photographs of selected areas. Course includes field mapping excursions to local areas and an 8-10 day exercise in a selected area of the Appalachian Mountains. A lab fee includes transportation and housing in the field. Prereq: permission. Lab. 4 cr.

734. APPLIED GEOPHYSICS
Gravity, magnetic, seismic, electrical, and thermal methods of investigating subsurface geology. Fieldwork and use of computers in data analysis. Prereq: Math 426 passed or taken concurrently; ESci 401; one year of college physics; /or permission. Lab. 4 cr.

741. GEOCHEMISTRY
Thermodynamics applied to geological processes; geochemical differentiation of the earth; the principles and processes which control the distribution and migration of elements in geological environments. 4 cr.

752. CHEMICAL OCEANOGRAPHY
Water structure, chemical composition and equilibrium models, gas exchange, biological effects on chemistry, trace metals, and analytical methods. Laboratory includes short cruise aboard R/V *Jere A. Chase*. Prereq: permission. Lab (optional). 3 or 4 cr.

754. SEDIMENTATION-STRATIGRAPHY
Sedimentation: weathering, transportation, and deposition of modern sediments. Stratigraphy: classification of sedimentary rocks and principles of stratigraphic correlation. Lab. 4 cr.

758. INTRODUCTION TO PHYSICAL OCEANOGRAPHY
Ocean basins; physical properties of seawater; atmosphere-ocean interaction; general ocean circulation; waves and tides; continental shelf and near-shore processes; instrumentation and methods used in ocean research. Simplified physical and mathematical models demonstrate the important concepts. Prereq: Phys 408; ESci 501; one year of college calculus; /or permission. Lab and field project optional. 3-4 cr.

759. GEOLOGICAL OCEANOGRAPHY
Major geological features and processes of the ocean floor; geological and geophysical methods; plate tectonics. Prereq: ESci 401; ESci 501; /or permission. 4 cr.

762. GLACIAL GEOLOGY
The glacial environment: glacier dynamics and glacial erosion and deposition. Review of world glacial stratigraphy in light of causes of glaciation and climatic change. Field trips. Prereq: ESci 401; ESci 561; /or permission. Lab. 4 cr.

781. PHYSICAL GEOLOGY
Materials and structures of the earth and erosive agents that modify them. Laboratory and field trips. For certified elementary or high school science teachers or for students in master's degree programs in education who need an introduction to the earth sciences. (Not available for credit after completing ESci 401 or equivalent.) 4 cr.

782. HISTORICAL GEOLOGY
Evolution of physical features and life on the earth. Fossil organisms; methods of historical geology; laboratory and field trips. Prereq: ESci 781 or equivalent. For certified elementary or high school science teachers or for students in master's degree programs in education who need an introduction to the earth sciences. (Not available for credit after completing ESci 402 or equivalent.) 4 cr.

795. TOPICS IN EARTH SCIENCES
A) Areal Geology; B) Geochemistry; C) Geomorphology, Advanced; D) Geophysics; E) Glacial Geology, Advanced; F) Groundwater Geology; G) Historical Geology, Advanced; H) Industrial Minerals: I) Micropaleontology; J) Mineral Fuels; K) Mineralogy, Advanced; L) Optical Crystallography; M) Ore Deposits; N) Paleontology, Advanced; O) Petrology, Advanced; P) Regional Geology; Q) Sedimentation; R) Stratigraphy; S) Structural Geology, Advanced; T) Marine Geology; U) Physical Oceanography; V) History of Geology; W) Earth Science Teaching Methods; X) Senior Synthesis; Y) Chemical Oceanography; Z) Glaciology, Advanced. Special problems by means of conferences, assigned readings, and field or laboratory work, fitted to individual needs from one of the areas listed above. 1-4 cr.

Economics (Econ)

PROFESSORS: Carroll M. Degler, emeritus; John A. Hogan, emeritus; Ruth J. Woodruff, emerita; Robert F. Barlow, Manley R. Irwin, John J. Korbel, Sam Rosen, Kenneth J. Rothwell, Charles B. Warden, Jr., Dwayne E. Wrightsman
ASSOCIATE PROFESSORS: Allan J. Braff, Dale G. Broderick, John M. Burt, Jr., Richard W. Hurd, Fred R. Kaen, Richard L. Mills, Robert C. Puth, Allen R. Thompson
ASSISTANT PROFESSORS: Michael A. Conte, Richard England, John Haskell, Marc Herold, Marilyn Power, Evangelos O. Simos
INSTRUCTOR: David J. Roddy

400. ECONOMIC ISSUES
Economic analysis applied to current issues such as environmental pollution, federal deficit spending, monopoly and waste, poverty, racism, the energy shortage, the urban crisis, war and the economy, etc., discussed in a nontechnical, conceptual framework. Reports and discussion on outside readings. No credit toward a major or minor in economics; no credit for students who have had Econ 401 or 402. 4 cr.

401. PRINCIPLES OF ECONOMICS (MACRO)
Basic functions of the United States economy viewed as a whole; policies designed to affect its performance. Economic scarcity, supply and demand, the causes of unemployment and inflation, the nature of money and monetary policy, the impact of government taxation and spending, the federal debt, and issues concerning economic growth. 4 cr.

402. PRINCIPLES OF ECONOMICS (MICRO)
Functions of the component units of the economy and their interrelations. Units of analysis are the individual consumer, the firm, and the industry. Theory of consumer demand and elasticity, supply and costs of production, theory of the firm under conditions of perfect and imperfect competition, demand for and allocation of economic resources, general equilibrium, and basic principles and institutions of international trade. (Not open to students who have had REco 411.) 4 cr.

515. ECONOMIC HISTORY OF THE UNITED STATES
United States economy from colonial times to the present. Models of economic development applied to the United States. How social, political, technological, and cultural factors shape economy; development and influence of economic institutions. 4 cr.

518. EUROPEAN ECONOMIC HISTORY
Western European economies from medieval times to the present. Explanations for differential growth rates and patterns; contrasts between political, social, and economic events. Prereq: Econ 401 or 402; /or permission. 4 cr.

525. INTRODUCTION TO ECONOMIC STATISTICS
Principal statistical concepts and techniques used in empirical economics: descriptive statistics, probability theory, random variables and their distributions, expected values, sampling inferential statistics, correlation and regression analysis, analysis of variance, time series analysis, index numbers. Also, principal sources of economic data. 4 cr.

601. INCOME DISTRIBUTION: WEALTH AND POVERTY
Examination of the distribution problem; historical development of distribution theories; comparative review of distribution systems, past and present. Students help select topics, e.g., distributive effects of the tax system and welfare policies to redistribute income. 4 cr.

605. INTERMEDIATE MICROECONOMIC ANALYSIS
Analysis of supply and demand. Determination of prices, production, and the distribution of income in noncompetitive situations and in the purely competitive model. General equilibrium. Prereq: Econ 402. 4 cr.

611. INTERMEDIATE MACROECONOMIC ANALYSIS
Macroeconomic measurement, theory, and public-policy determination. Prereq: Econ 401 and 402. 4 cr.

615. HISTORY OF ECONOMIC THOUGHT
Examination and critical appraisal of the work of major economists, including the work of contemporary economists, and major schools of economists, particularly with reference to the applicability of their theories to current economic problems. Prereq: Econ 401 and 402. 4 cr.

626. INTRODUCTION TO QUANTITATIVE ECONOMICS
Development of the concept of a simple, testable economic model of explanatory or forecasting type. Alignment of the model with reality by means of computer-performed statistical estimation. Types of error, consequences, and possible methods of dealing with errors. Prereq: Econ 525. 4 cr.

110

630. COMPARATIVE STUDY OF ECONOMIC SYSTEMS
Theoretical models of capitalism and socialism. Their historical implementation as exemplified by the United States, France, Yugoslavia, U.S.S.R., China, and Cuba. Prereq: Econ 401 and 402. 4 cr.

635. MONEY AND BANKING
Financial markets, financial institutions, monetary theory, monetary policy, causes and cures of inflation and related problems. Prereq: Econ 401 and 402. 4 cr.

641. PUBLIC FINANCE
Analysis of the public sector. Welfare, optimality, and market failure in the private sector. Optimal provision of public goods; corrections for externalities; optimal public expenditure policy. Analysis of tax effects and incidence. Optimal taxation policies. Prereq: Econ 401 and 402. 4 cr.

645. INTERNATIONAL ECONOMICS
Trade theory and commercial policy. Free trade, protection, common markets. Economic aspects of international relations, with particular reference to recent policy issues. Prereq: Econ 401 and 402. 4 cr.

651. GOVERNMENT REGULATION OF BUSINESS
Mergers, competition, monopoly, and the regulated industries. 4 cr.

655. LABOR UNIONS AND THE WORKING CLASS
Workers' role in the economy and the unions they form to protect their interests. History of the American labor movement; evaluation of the success of unions in fulfilling workers' needs. Management's relationship with workers in the context of a power struggle between unions and managers. Government's role in collective bargaining as intermediary and as employer. 4 cr.

656. LABOR ECONOMICS
Functioning of labor markets from theoretical and policy perspectives. Labor supply, wage determination, internal labor markets, and barriers to upward labor market mobility. Poverty, unemployment, inflation, and wage-price controls. Prereq: Econ 401 and 402; /or permission. 4 cr.

668. ECONOMIC DEVELOPMENT
Analysis of problems and available solutions confronting the underdeveloped areas of the world. Prereq: Econ 401 and 402. 4 cr.

695-696. INDEPENDENT STUDY
Individual projects of special interest and benefit. Prereq: permission of undergraduate counselor and proposed project supervisor. Granted to students with unusual initiative. Variable (in multiples of 2) 2-12 cr.

698. TOPICS IN ECONOMICS
Special topics. May be repeated. Prereq: permission. 4 cr.

711. ECONOMIC FLUCTUATIONS
Recurrent movements of prosperity and depression; emphasis on causes and public-policy implications. Prereq: Econ 611 or permission. 4 cr.

715. MARXIAN ECONOMIC ANALYSIS
Marx's analysis of capitalism within the classical and radical tradition; methodology; organization of capital; labor theory of value; accumulation of capital; growth and distribution; economic crises. Critical evaluation of Marx's analysis. Prereq: Econ 605 and 611; /or permission. 4 cr.

720. U.S. ECONOMIC HISTORY
From colonial times to the present. Applied economic theory; economic models and interpretation of data. Influence of technology, industrialization, foreign trade, monetary factors, and government; noneconomic factors. Prereq: Econ 605 and 611; /or permission. 4 cr.

721. EUROPEAN ECONOMIC HISTORY
Western European and Mediterranean economies from medieval times to the Common Market. Economic models and interpretation of data. Capital accumulation, technology, trade, industrialization, monetary factors, and the role of government; relevant noneconomic factors. Prereq: Econ 605 and 611; /or permission. 4 cr.

727. ADVANCED ECONOMETRICS
Provides familiarity with standard proofs and propositions of theoretical econometrics and develops competence in the application of relatively advanced econometric techniques. Use of computer required. Prereq: permission. 4 cr.

735. ECONOMICS OF FINANCIAL MARKETS
Economic analysis of financial market systems. Topics include financial market functions, theories of saving and investment, financial intermediation, flow-of-funds analysis, loanable funds theory, interest rate forecasting, portfolio theory, capital-asset pricing models, structure of interest rates (including term-structure theory), and macroeconomic models of the financial sector. Prereq: Econ 635. 4 cr.

736. SEMINAR IN MONETARY THEORY AND POLICY
Contemporary developments in monetary theory and the evaluation of policy measures. Prereq: Econ 635. 4 cr.

737. DECISION THEORY AND BAYESIAN METHODS
Utility, decision problems, prior and posterior distributions, sufficiency, estimation and hypothesis testing, linear models and sequential sampling. Emphasis on applications to business and economics. Prereq: Math 735. (Also offered as Math 737.) 4 cr. (Not offered every year.)

741. SEMINAR IN PUBLIC FINANCE—THEORY AND POLICY
Selected topics in contemporary theoretical and policy problems of public finance. Prereq: Econ 641. 4 cr.

745. INTERNATIONAL TRADE
Contemporary issues in international economic theory and policy. Analysis of trade theory, dynamics of world trade and exchange, and international commercial policy. Prereq: Econ 645. 4 cr.

746. INTERNATIONAL FINANCE
International monetary mechanism; balance of payments, international investment; exchange rates, adjustment systems, international liquidity, foreign aid, multinational corporations. Prereq: Econ 401 and 402. 4 cr.

747. MULTINATIONAL ENTERPRISES
Internationalization of economies. Growth and implications of multinational corporations at the level of systems. Theories of imperialism, international unity/rivalry; theories of direct investment, exercise of influence and conflict, technology transfer, bargaining with host country; effects on U.S. economy. Prereq: permission. 4 cr.

751. GOVERNMENT REGULATION OF BUSINESS
Analysis of government policy with reference to such problems as conspiracy, monopoly, mergers, unfair practices, and discrimination; legal and economic appraisal of government policy alternatives. Prereq: Econ 651. 4 cr.

752. SEMINAR IN INDUSTRIAL ORGANIZATION AND PUBLIC POLICY
Historical and contemporary developments in the theoretical and applied areas of industrial and commercial market structures, behavior, and performance. Prereq: Econ 651; permission. 4 cr.

755. COLLECTIVE BARGAINING
Historical development of the U.S. labor movement and the industrial relations system. Contemporary collective bargaining issues; the role of public policy in industrial relations. Prereq: Econ 655. 4 cr.

756. LABOR ECONOMICS
Recent developments in labor market analysis and public policies related to contemporary labor issues. Labor supply, the structure and stratification of labor markets, economic discrimination, unemployment and poverty, inflation, and wage-price controls. Prereq: Econ 656. 4 cr.

757. ECONOMICS OF WORK
Organization of work under capitalism. Competing management philosophies; response of workers to management practices. Satisfaction of workers with their jobs, trends in worker productivity, alternative work arrangements, and worker participation in management. Prereq: Econ 655 or Econ 656; or permission. 4 cr.

758. LABOR MARKET MODELING
Labor supply and demand forecasting models. Demographic projections of supply. Industrial, occupational projections of demand. Simulation models for analyzing the impact of manpower and welfare programs. Use of the computer involved in doing assigned exercises, but no prior familiarity with computers is required. Prereq: permission. 4 cr.

761. NATIONAL ECONOMIC PLANNING
Planning in a market economy: the new industrial state. Planning as a substitute for markets: the developing countries. Planning as a way of transforming society; socialist economies; techniques of planning social and political issues related to various planning methods. Prereq: Econ 605 and 611; /or permission. 4 cr.

768. SEMINAR IN ECONOMIC DEVELOPMENT
Theories of the development process; role of various forces of economic change in developing countries. Prereq: Econ 668. 4 cr.

769. CASE STUDIES IN ECONOMIC DEVELOPMENT
Problems and policies in selected countries; evaluations of national plans, programs, and projects; comparative analysis. Sections: A) Southeast Asia; B) Cost-Benefit and Project Analysis; C) Africa; D) South America. Prereq: Econ 401 and 402; /or permission. 4 cr.

798. ECONOMIC PROBLEMS
Special topics; may be repeated. Prereq: permission of adviser and instructor. 2 or 4 cr.

Education (Educ)

CHAIRPERSON: Roland B. Kimball
COORDINATOR OF TEACHER EDUCATION: Stephen R. Birrell
PROFESSORS: Everett B. Sackett, dean emeritus; Thomas O. Marshall, emeritus; Angelo V. Boy, Bud B. Khleif, Roland B. Kimball, Carleton P. Menge, Gerald J. Pine
ADJUNCT PROFESSOR: Donald D. Durrell
ASSOCIATE PROFESSORS: Joseph J. Petroski, emeritus; Michael D. Andrew, Charles H. Ashley, Jason E. Boynton, John J. Carney, John G. Chaltas, Ellen D. Corcoran, Ann L. Diller, David D. Draves, Donald H. Graves, David J. Hebert, M. Daniel Smith, Deborah E. Stone, Dwight Webb
ADJUNCT ASSOCIATE PROFESSORS: Edward D. Durnall, Richard M. Goodman
ASSISTANT PROFESSORS: Richard F. Antonak, Robert B. Babcock, Michael C. Diamonti, Susan D. Franzosa, Jane A. Hansen, Cynthia M. Homer, Bruce L. Mallory, Sharon N. Oja, Mary B. Winslow
ADJUNCT ASSISTANT PROFESSORS: David Cross, Katherine H. Speare
FACULTY IN RESIDENCE: John E. Williamson
LECTURER: Richard L. Schwab
RESIDENT SUPERVISORS: Ann Andrew, Manning Atherton, James Bair, William Childs, Bert Cohen, Harold Krevolin, Anna Russell

500. EXPLORING TEACHING
For students considering a teaching career. In-school experiences to develop introductory skills in observation and teaching. On-site seminars for analysis and evaluation. Assessment and advisement related to teaching as a career. Prerequisite for further work toward teacher certification. A minimum of seven hours a week, plus travel time, required. Prereq: permission. 4 cr. Cr/F.

611. TEACHING ELEMENTARY SCHOOL SOCIAL STUDIES
Objectives, content, methods, and materials. (Offered in Division of Continuing Education only.) 4 cr.

612. TEACHING ELEMENTARY SCHOOL MATHEMATICS
Objectives, content, methods, and materials. (Offered in Division of Continuing Education only.) 4 cr.

613. TEACHING ELEMENTARY SCHOOL SCIENCE
Involvement with strategies; inquiry and discovery approaches compared with more conventional methods; selection and justification of goals. Survey of resources available for science teachers; analysis of current curriculum projects. (Offered in Division of Continuing Education only.) 4 cr.

691. SCIENCE CURRICULUM AND INSTRUCTION
For inservice and preservice secondary teachers of physics, chemistry, earth science, or general science. Modern curricula and methods; contemporary programs of national interest. Science teaching goals and methods. 4 cr.

694 COURSES IN SUPERVISED TEACHING
Supervised Teaching of Physical Education. 8 cr. Cr/F. Supervised Teaching of Occupational Education. 8 cr. Cr/F. Supervised Teaching of Home Economics. 8 cr. Cr/F. Supervised Teaching of Music. 8 cr. Cr/F.

700. EDUCATIONAL STRUCTURE AND CHANGE
A) Education in America: Background, Structure, and Function; B) Who Runs the Schools? C) Curriculum Structure; D) Curriculum Change Strategies; E) New Directions in Curriculum; F) Outdoor Learning Environments; G) New Directions in Education; H) Alternative Schools; I) Experiential Curricula; J) Alternative Learning Environments; K) Curriculum for the Disenchanted Student; L) Education in the Middle Years; M) What *Is* an Elementary School? N) Public Attitudes toward American Schools; O) Communication Styles and Conflict Resolution; P) Personal and Institutional Change; Q) Educational Structure and Change; R) Open Education in Elementary and Middle Schools, S) Children with Special Needs: Historical and Institutional Aspects. Organization, structure, and function of American schools; processes of change in education; how successful innovation is accomplished. Field experience options. Students may choose from variable-credit modules offered each semester (listed in department prior to preregistration; refer to *Time and Room Schedule*). Minimum of 4 cr. required for teacher certification. Prereq: Educ 500 or permission. 1, 2, or 4 cr.

112

701. HUMAN LEARNING AND DEVELOPMENT: EDUCATIONAL PSYCHOLOGY
A) Human Learning and Development: Educational Psychology; B) Human Development and Learning: Educational Psychology; C) Human Development; D) Ages and Stages: Aspects of Development; E) Behavior Modification and Classroom Management; F) Learning, Emotional, and Behavior Disabilities; G) Learning, Motivation, and Evaluation; H) The Development of Thinking; I) Cognitive and Moral Development; J) Evaluating Classroom Learning; K) Child Development, Individual Differences, and Teacher Characteristics; L) Intelligence and Creativity; M) Sex Role Learning and School Achievement; N) Language Development in Children; O) Deliberate Psychological Education. Development, learning theory, and instructional theory applied to teaching. Students may choose from variable-credit modules offered each semester (listed in department prior to preregistration; refer to *Time and Room Schedule*). Minimum of 4 cr. required for teacher certification. Prereq: Educ 500 or permission. 1, 2, or 4 cr.

703. ALTERNATIVE TEACHING MODELS
A) Alternative Teaching Models; B) Maintaining Classroom Control; C) Teaching Strategies; D) Individualized and Varied Learning; E) The Integrated Unit: Plan Development; F) Language Arts Concepts for Elementary School Teachers; G) Teaching Elementary and Middle School Science; H) Verbal-Nonverbal Teaching Behaviors; I) Simulation and Learning Games; J) Nature and Goals of Social Studies: K-12; K) Instructional Materials of Social Studies: K-12; L) Integrated Curricula; M) Children with Special Needs: Strategies for the Classroom Teacher; N) Classroom Discipline to Produce Responsible Children. Analysis and application of basic teaching models and techniques (from teacher-directed to student-centered). Observation of master classroom teachers and exemplary videotapes; service as aides to master-teachers; seminars. Techniques and analysis systems through observation of videotapes, micro-teaching, completion of appropriate self-instruction units, and seminars. Students may choose from variable-credit modules offered each semester (listed in department prior to preregistration; refer to *Time and Room Schedule*). Minimum of 4 cr. required for teacher certification. Prereq: Educ 500 or permission. 1, 2, or 4 cr.

705. ALTERNATIVE PERSPECTIVES ON THE NATURE OF EDUCATION
A) Contemporary Educational Perspectives; B) Controversial Issues in Education I; C) Controversial Issues in Education II: D) Concepts of Teaching: Differing Views; E) Curriculum Theory and Development; F) Readings on Educational Perspectives; G) Philosophy of Education; H) The Scope of Education; I) Education as a Form of Social Control; J) School Reform Theories; K) Schooling and the Rights of Children; L) Education, Inequality, and the Meritocracy; M) Readings in Philosophies of Outdoor Education; N) Alternative Perspectives on the Nature of Education. Students formulate, develop, and evaluate their own educational principles, standards, and priorities. Alternative philosophies of education; contemporary educational issues. Students may choose from variable credit modules offered each semester (listed in department prior to preregistration; refer to *Time and Room Schedule*). Minimum of 4 cr. required for teacher certification. Prereq: Educ 500 or permission. 1, 2, or 4 cr.

706. INTRODUCTION TO READING INSTRUCTION IN THE ELEMENTARY SCHOOLS
Reading process; current procedures and materials; diagnostic techniques; practicum experience. Course satisfies reading requirement for prospective elementary teachers in the five-year teacher education program and may be included in the 12 required graduate credits in education at the graduate level. Course may also be taken for undergraduate credit before entrance into fifth year; in this case the course satisfies reading requirement but is not applicable toward the 12 required graduate credits. Prereq: Educ 500. 4 cr.

707. APPROACHES TO TEACHING READING AT THE SECONDARY LEVEL
The Reading Curriculum in The Secondary School: structural components (developmental, corrective, remedial); materials and methods of instruction and appraisal; instruments of measurement and evaluation in the comprehensive secondary reading program. 2 cr. *Teaching Reading through the Content Areas: Alternatives and Application:* new approaches, concepts, and methodologies of teaching reading through content materials; workshop to develop and produce instructional strategies and materials for an integrated reading-content program. (Two credits of 707 may be used to satisfy 2 credits of Educ 700.) 2 cr.

734. CHILDREN'S LITERATURE
Interpretive and critical study of literature for children in the elementary, middle, and junior high schools. Methods of using literature with children. 4 cr.

750. INTRODUCTION TO EXCEPTIONALITY
Social, psychological, and physical characteristics of exceptional individuals including intellectual (gifted, retarded, learning disabled); sensory (visual, auditory); motor (orthopedic); health; and communication. Implications for educational and human service delivery. 4 cr.

751. EDUCATING EXCEPTIONAL LEARNERS
Issues in special education (labeling, mainstreaming, efficacy); techniques of special teaching (referral, assessment, observation, task analysis, profiling, selecting materials, intervention). Issues in special teaching (behavior modification, ability training). Primary application to mild and moderate handicaps. Co- or prereq: Educ 750 or permission. 4 cr.

752. DIAGNOSIS AND REMEDIATION OF LEARNING DISABILITIES
Terminology, etiology, common characteristics, and symptoms; theory and practice in gross-motor, visual, and auditory remediation; testing procedures used in diagnosis and remediation programs. 4 cr.

753. TEACHING CHILDREN WITH BEHAVIOR DISORDERS
Nature and scope of emotional disturbances and social maladjustment in children, including causes, characteristics, treatment implications, and educational problems. 4 cr.

763. INTRODUCTION TO EDUCATIONAL MEDIA
Educational media in the learning process; curricular integration of materials and equipment in the school library media center; design and implementation of learning systems that provide a framework for the development of individual skills. 4 cr.

775. DIAGNOSTIC TEACHING OF READING
Classroom implementation of diagnosis and remediation of reading disabilities; for teachers, counselors, administrators, and other school personnel. 4 cr.

785. EDUCATIONAL TESTS AND MEASUREMENTS
Theory and practice of educational evaluation; uses of test results in classroom teaching and student counseling; introductory statistical techniques. 4 cr.

795, 796. INDEPENDENT STUDY
Juniors and seniors only, with approval by appropriate faculty member. 2 or 4 cr.

797. SEMINAR IN CONTEMPORARY EDUCATIONAL PROBLEMS
Issues and problems of special contemporary significance, usually on a subject of recent special study by faculty member(s). Prereq: permission. May be repeated for different topics. 1-4 cr.

Electrical and Computer Engineering (E E)

CHAIRPERSON: Ronald R. Clark
PROFESSORS: Leon W. Hitchcock, emeritus; Fletcher A. Blanchard, Ronald R. Clark, Albert D. Frost, John B. Hraba, Fred Manasse, Joseph B. Murdoch, Alden L. Winn
ADJUNCT PROFESSOR: Sidney W. Darlington
ASSOCIATE PROFESSORS: Glen C. Gerhard, Filson H. Glanz, Donald W. Melvin, Paul J. Nahin, John L. Pokoski, Kondagunta Sivaprasad, Kerwin C. Stotz
ASSISTANT PROFESSORS: L. Gordon Kraft, W. Thomas Miller, Dana B. Rogers

431. SPEECH, MUSIC, AND NOISE: THE SCIENCE OF SOUNDS
Physical nature of sound waves. Production of sounds by mechanical vibration in string instruments, drums, loudspeakers, or by air column resonances in horns and organ pipes. Characteristics of hearing; human perception of sound, loudness, pitch, and intensity. Speech communication and the acoustics of the classroom, theater, or concert hall. Noise, its control and reduction; criteria for the judgement of annoyance. Application of acoustics and noise control for environmental protection and in industry, transportation, biology, and medicine. Amplification, storage, and reproduction of sound. Open for credit to nonengineering and nonphysics students only. Prereq: high school mathematics. Lab. 4 cr.

432. LIGHT: SOURCES AND USES
Edison's lamp to the laser; production of light; color, the spectrum, and the human eye; sources of light; lenses and reflectors; the four factors of seeing; daylighting, energy, designing lighting installations. Lighting applications in interior spaces and outdoors. Open for credit to nonengineering and nonphysics students only. Prereq: high school algebra, trigonometry, and physics, or college courses in these. Lab. 4 cr.

517. JUNIOR LABORATORY I
Application of techniques in electrical engineering. Prereq: E E 551 taken concurrently. 1 cr.

518. JUNIOR LABORATORY II
Laboratory investigations synthesizing classroom knowledge in circuits, electronics, electromagnetics, and signal processing. Prereq: E E 517; E E 552 and 656 should be taken concurrently with, or prior to, 518. 3 cr.

531. ELEMENTS OF DIGITAL SYSTEMS
Fundamental design and analysis principles. Number systems, switching algebra, logic circuits, codes, and an introduction to digital computers. Laboratory: student-built systems using modern integrated circuit technology; "hands-on" experience with a minicomputer. For non-E E majors. Lab. 4 cr.

541. ELECTRICAL CIRCUITS
Linear passive circuit theory. Circuit element characteristics. Fundamental circuit laws, equivalent circuits, power and energy relations, mesh and node analysis applied to resistive circuits. Transient and steady-state circuit analysis using Laplace Transform techniques, steady-state phasor AC circuit analysis. Prereq: Math 426. Lab. 4 cr.

543. INTRODUCTION TO DIGITAL SYSTEMS
Fundamental design and analysis principles. Number systems, switching algebra, logic circuits, codes, and an introduction to digital computers. Laboratory: student-built systems using modern integrated circuit technology; "hands-on" experience with a minicomputer. For E E majors. Lab. 4 cr.

544. SIGNAL PROCESSING FUNDAMENTALS
Infinite series, differential calculus of functions of several variables. Vector differential and integral calculus with applications to electrostatics and magnetostatics. Prereq: Math 527. 3 cr.

545. ELECTRICAL NETWORKS
Two ports and transfer functions, time and frequency domain concepts, Fourier series and transforms, state equations, convolution, introductory network synthesis, passive and active filter design, approximation, and transmission lines. Prereq: E E 541. 3 cr.

546. PROBABILITY AND DISCRETE SYSTEMS
Emphasis on applied engineering concepts including probability, difference equations and discrete state models, z transforms, sampling, digital filters and discrete Fourier analysis. Prereq: E E 544; E E 545; Math 527. 3 cr.

548. CIRCUITS AND ELECTRONICS
Continuation of Electrical Circuits, including power in AC circuits, frequency response, and resonance. Linear active circuit theory. Topics include semiconductor devices and applications, bias design, amplifier behavior and modeling, special amplifiers, and amplifier frequency response. Prereq: E E 541. Lab. 4 cr.

551. ADVANCED ELECTRONICS I
Biasing circuits; thermal stability, power, small signal, and differential amplifiers; feedback theory, analysis and design. Sinusoidal oscillators, modulators, detectors, and analog circuits. Prereq: E E 548. 3 cr.

552. ADVANCED ELECTRONICS II
Analysis and design of digital and switching circuits using both discrete and integrated components. Prereq: E E 543; E E 551. 3 cr.

603. ELECTROMAGNETIC FIELDS AND WAVES I
Maxwell's equations in integral and differential form; uniform plane waves in free space and material media; boundary conditions; simple transmission line theory; parallel plate and rectangular waveguides; simple radiating systems. Prereq: Math 527; E E 544 or equivalent. 3 cr.

604. ELECTROMAGNETIC FIELDS AND WAVES II
Loop antennas; aperture and cylindrical antennas; self and mutual impedence; receiving antennas and antenna arrays; bounded plane waves; rectangular and cylindrical waveguides; waveguide discontinuities and impedence matching; solid state microwave sources. Prereq: E E 603. 4 cr.

605. ELECTRONIC PROPERTIES OF MATERIALS AND DEVICES
Nature of the electron, energy level, crystal structure, band theory and semi-conductor statistics, and electronic transport processes. PN junction theory, surface effects, physics of bipolar and field effect transistors, charge-controlled devices and optoelectronic devices, dielectric and magnetic properties of solids. Prereq: Phys 505; E E 551; E E 603. 4 cr.

612. LOGICAL DESIGN OF DIGITAL COMPUTERS
Computer architecture, including arithmetic, memory, control, and input-output units; the trade-offs between hardware, software, and cost. "Hands-on" laboratory experience with machine language programming, interfacing of peripherals, etc., on minicomputers and microcomputers. Prereq: C S 410; E E 531 or 543; permission. Lab. 4 cr.

114

620. ELECTRONICS AND INSTRUMENTATION
For nonengineering and nonphysics students; no mathematical or engineering detail. Techniques for using electronic instruments and equipment. DC and AC circuits, electronic amplifiers, grounding and shielding problems, transducers, electronic instruments, schematic reading, transients, noise problems, and digital techniques. Prereq: junior standing. 4 cr.

656. ELECTROMECHANICAL DEVICES
Theory and analysis of transformers, rotating machines, transducers and control system components, and other energy conversion methods. Prereq: E E 603; E E 548. Lab. 3 cr.

695. ELECTRICAL ENGINEERING PROJECTS
Laboratory or advanced study course. Students either join a department research project or engage in a project in an area of staff interest. Prereq: acceptance by staff member. 1-4 cr.

700-level courses are offered subject to adequate student demand.

711. DIGITAL SYSTEMS
Advanced switching theory techniques; digital design tools; design of microprocessor-based systems; general design procedures, including top down design techniques, documentation, noise reduction, etc. Prereq: E E 612; permission. Lab. 4 cr.

714. MINICOMPUTER APPLICATIONS ENGINEERING
Organization and operation of minicomputer-based systems. Interfacing of special purpose peripherals, digital filters, system simulation, program and data organization, priority interrupt processing of tasks, real-time monitor systems. Applications to communication, automated-measurement, and process-control systems. Prereq: E E 531 or 543; programming experience; permission. Lab. 4 cr.

727. POWER SYSTEMS
Modeling and planning of electric power transmission systems. Prereq: E E 656; permission. 4 cr.

741. FLUID CONTROL SYSTEMS
Mathematical modeling of hydraulic, pneumatic, and fluidic control elements and control systems. Methods for 1) analysis of systems of using gases or liquids as the working fluid; 2) synthesis of the parameters of the control elements used in automatic control systems; 3) design of these systems. (Also offered as M E 741.) 4 cr.

745. FUNDAMENTALS OF ACOUSTICS
Acoustic wave equation for air; laws of reflection, refraction, and absorption; characteristics and measurement of acoustical sources; human perception of sound, loudness, intensity; microphones; acoustical materials; problems in environmental sound control; ultrasonics; architectural acoustics. Prereq: Phys 408; Math 527; permission. Lab. 4 cr.

757. FUNDAMENTALS OF COMMUNICATION SYSTEMS
Discussions of deterministic signals, Fourier spectra, random signals, and noise, baseband communication, analog and digital modulation schemes, and system signal to noise ratio. Prereq: E E 545; permission. Lab. 4 cr.

758. COMMUNICATION SYSTEMS
Design of high-frequency communication systems. RF amplification, modulators for AM and FM systems, receiving techniques, antennas, free-space propagation, propagation characteristics of the ionosphere. Prereq: E E 603; E E 757 or equivalent; permission. Lab. 4 cr.

762. ILLUMINATION
Radiation; color and spectra; physics of light production; sources of ultraviolet, visible, and infrared energy; lamp circuitry; control of light; lighting design, daylighting, light and energy applications of light in business, industry, school, home, and outdoors. Open to juniors and seniors in engineering and physics. Prereq: permission. Lab. 4 cr.

775. APPLICATIONS OF INTEGRATED CIRCUITS
Design and construction of linear and nonlinear electronic circuits using existing integrated circuits. Limitations and use of operational amplifiers. Laboratory course in practical applications of nondigital integrated circuit devices. Prereq: permission. 4 cr.

781. OCEAN INSTRUMENTATION
Analysis and design of instrumentation systems. Sensors, circuits, and devices for measurement and control. Elements of probability and statistics as applied to instrument design and data analysis. Transmission, display, storage and processing of information. The design, implementation, testing and evaluation of an ocean-related instrument system is an integral part of the course. Prereq: senior standing in Electrical and Computer Engineering or permission. 4 cr.

782. CONTROL SYSTEMS
Fundamental principles involved in the design and analysis of feedback control systems. Topics include stability criterion, time-domain analysis, frequency-domain analysis, and introduction to nonlinear systems. Prereq: permission. Lab. (Also offered as ME 782.) 4 cr.

783. BIOMEDICAL ENGINEERING
Engineering applied to cardiovascular, renal, gastrointestinal, sensory, reproductive, and other organ systems. Design and utilization of diagnostic, monitoring, and prosthetic techniques and devices. Prereq: permission. Lab. 4 cr.

784. BIOMEDICAL INSTRUMENTATION
Principles of physiological and biological instrumentation design including transducers, signal conditioning, recording equipment, and patient safety. Laboratory includes the design and use of instrumentation for monitoring of electrocardiogram, electromyogram, electroencephalogram, pulse and temperature. Current research topics, such as biotelemetry, ultrasonic diagnosis, and computer applications. Prereq: permission. Lab. 4 cr.

785. UNDERWATER ACOUSTICS
Vibrations, propagation, reflection, scattering, reverberation, attenuation, sonar equations, ray and mode theory, radiation of sound, transducers, and small- and large-signal considerations. Prereq: permission. 4 cr.

786. INTRODUCTION TO RADIO ASTRONOMY
Electromagnetic radiation, propagation. Positional astronomy and the radio sky, discrete radio sources, source-structure distribution, the sun as a radio source, flare and burst activity, planetary emissions, quasars, pulsars, techniques of observation and data reduction, radiometry, polarimeters, correlation interferometers, aperture synthesis. Prereq: senior or graduate status in engineering and physical sciences; permission. 4 cr.

796. SPECIAL TOPICS IN ELECTRICAL ENGINEERING
New or specialized courses and/or independent study. Prereq: permission. 2 or 4 cr.

Engineering Technology (E T)

PROGRAM DIRECTOR: Donald W. Melvin
ASSISTANT PROFESSORS: Kenneth Burt and David Forest, electrical engineering technology
INSTRUCTOR: T. Antero Parssinen, mechanical engineering technology
LECTURER: Wayne Lundblad, mechanical engineering technology

Permission of instructor is a prerequisite to all Engineering Technology courses.

633. BUSINESS ORGANIZATION AND LAW
Corporations; proprietorships; product liability; contracts; O.S.H.A.; commercial paper; conditions of employment, I.R.S.; bankruptcy; U.C.C.; agencies. 4 cr.

634. ECONOMICS OF BUSINESS ACTIVITIES
Elementary financial accounting; compound interest and time value of money; sources of capital; cost estimating; depreciation; risk and insurance; personal finance. 4 cr.

637. HEAT AND FLUID POWER I
Topics covered will include work and heat, first and second laws of thermodynamics, entropy, chemical reactions, heat engines and refrigerators. These concepts will be applied to various cycles (i.e., powerplants, turbines, jet engines, etc.). Field trips. Lab. 4 cr.

638. HEAT AND FLUID POWER II
A continuation of 637 for MET students only. Further intensive applications of thermodynamics. Additional topics will include heat transfer and fluid dynamics. Lab. 4 cr.

641. PRODUCTION SYSTEMS
Production standards—sources, uses; manufacturing capacity—design, analysis; manufacturing inventories and their control; production scheduling; production control. 4 cr.

644. MECHANICAL ENGINEERING TECHNOLOGY CONCEPTS IN DESIGN AND ANALYSIS
Topics will include kinematics, kinetics, work and energy and vibrations. Intensive application of these concepts to problems in machine design. 4 cr.

651. MECHANICAL ENGINEERING TECHNOLOGY PROJECT
Group project; students required to find solutions to actual technological problems in design, fabrication, and testing as posed by industry. Student team defines the problem, prepares a budget, and works with the client company to research, design, build, and test the software and/or hardware needed. A yearlong course: 4 cr. each semester, 8 cr. total, an "IA" grade (continuous course) given at the end of first semester. Withdrawal from course results in loss of credit.

671. DIGITAL SYSTEMS
A digital systems design and applications course using TTL and CMOS MSI and LSI devices. Topics include: logical design, memory systems, interfacing (serial and parallel), and an introduction to microcomputers. A digital design project is required. Lab. 4 cr.

674. CONTROL SYSTEMS AND COMPONENTS
Feedback, principles; stability, Nyquist criteria; performance charts; introduction to equalizer design; control system components. Analog computer simulations. Lab. 4 cr.

675. ELECTRICAL TECHNOLOGY I
Electrical circuits—DC and AC; polyphase circuits; transformers; DC and AC machinery and their control; physical principles of electronic devices. Lab. 4 cr.

676. ELECTRICAL TECHNOLOGY II
Equivalent circuits of electronic devices; power supplies; transistor amplifiers—frequency response; introduction to digital electronics; transducers and instrumentation systems. Lab. 4 cr.

677. ANALOG SYSTEMS
Op Amp specifications, instrumentation and bridge amplifiers, advanced Op Amp circuits and linear ICs. Lab applications. Lab. 4 cr.

680. COMMUNICATIONS AND FIELDS
Modulation and demodulation; noise, filter design, active filters and phase-lock loops; electric and magnetic fields; transmission lines; waveguide principles and components; antennas and radiation. Lab. 4 cr.

690. MICROCOMPUTER TECHNOLOGY
Microprocessors; their operation, programming, interfacing, and various uses. The 8080A/8085A is used as an operational model for hardware and software applications. SDK-85 microcomputer development systems are used for lab. Microcomputer applications, with emphasis on lab work. Lab. 4 cr.

691. ELECTRICAL ENGINEERING TECHNOLOGY PROJECT
Group project; students are required to find solutions to actual technological problems in design, fabrication, and testing, as posed by industry. Student team defines the problem, prepares a budget, and works with the client company to research, design, build, and test the software and/or hardware needed. A yearlong course: 4 cr. each semester, 8 cr. total, an "IA" grade (continuous course) given at end of first semester. Withdrawal from course results in loss of credit.

695. INDEPENDENT STUDY
A) Topics in Engineering Technology Mathematics; B) Topics in Mechanical Engineering Technology; C) Topics in Electrical Engineering Technology. 1-4 cr.

English (Engl)

CHAIRPERSON: Jean E. Kennard
PROFESSORS: Sylvester H. Bingham, emeritus; Max S. Maynard, emeritus; Robert G. Webster, emeritus; Thomas A. Carnicelli, Carl Dawson, Karl C. Diller, Robert Hapgood, Jean E. Kennard, Terence P. Logan, Edmund G. Miller, Donald M. Murray, Philip L. Nicoloff, John C. Richardson, Charles D. Simic, Mark R. Smith, Thomas A. Williams, Jr., John A. Yount
ASSOCIATE PROFESSORS: Michael V. DePorte, Elizabeth H. Hageman, Gary H. Lindberg, Andrew H. Merton, Susan Schibanoff
VISITING ASSOCIATE PROFESSOR: Tashio Saito
ASSISTANT PROFESSORS: Mary M. Clark, Lester A. Fisher, Melody G. Graulich, Thomas R. Newkirk, Hugh M. Potter, David V. Siddall, David H. Watters, Ronald A. Winslow, Jr.
INSTRUCTORS: Janet Aikins, Patrocinio P. Schweickart
LECTURER: Josephine Donovan

See departmental brochure for detailed descriptions of course offerings.
English 401 is a prerequisite for all English courses but 301 and 302.

301. IMPROVEMENT IN WRITING
Required of all students whose attainments in the fundamentals of English are found to be unsatisfactory. 0 cr. Cr/F. (Not offered every year.)

302. IMPROVEMENT IN READING
Intensive drill in reading skills for six weeks. 0 cr. Cr/F. (Not offered every year.)

116

400. ENGLISH AS A SECOND LANGUAGE
A course to improve the competence of foreign students in listening comprehension, speaking, reading, and writing. Recommended as preparation for Engl 401. Prereq: student should meet with and have the permission of the instructor. 4 cr.

401. FRESHMAN ENGLISH
Training to write more skillfully and to read with more appreciation and discernment. Frequent individual conferences for every student. 4 cr.

402. FRESHMAN SEMINARS—APPROACHES TO LITERATURE
Intensive study of a specific topic, theme, genre, major figure, or period of English or American literature. *No credit toward the English major.* For details, see the course descriptions available in the department office and from freshman advisers. 4 cr. (Not offered every year.)

501. INTRODUCTION TO PROSE WRITING
Nonfiction writing; weekly papers and frequent conferences. May be repeated for credit with the approval of department chairperson. 4 cr.

505. INTRODUCTION TO LINGUISTICS
An overview of the study of language: animal communication vs. human language, universal properties of human language, Chomsky's innateness hypothesis, language acquisition in children, dialects and language variation, language change. Includes an introduction to modern grammar (phonology, syntax, and semantics) and to scientific linguistic methodology. (Also offered as Ling 505.) 4 cr.

512. INTRODUCTION TO AMERICAN LITERATURE
Works of major American writers from Irving to Faulkner, with emphasis on how to adapt and present the material to high school English classes. Open only to English teaching majors. 4 cr. (Not offered every year.)

513, 514. INTRODUCTION TO ENGLISH LITERATURE
Selected classic works in poetry and prose considered in chronological order and historical context. Attention to the works and to the ideas and tastes of their periods. 513: Beowulf through 18th century. 514: 1800 to the present. 4 cr.

515, 516. A SURVEY OF AMERICAN LITERATURE
515: From the beginning of American literature to the Civil War. 516: from the Civil War to the present. 4 cr.

518. THE BIBLE AS LITERATURE
Literature of the Old and New Testaments and the Apocrypha, primarily in the King James version. 4 cr.

519. INTRODUCTION TO CRITICAL ANALYSIS
Critical analysis of fiction, poetry, and drama. Frequent short papers. Required of all English majors; should be taken early in their programs. 4 cr.

520. LITERATURE AND THE HISTORY OF IDEAS
An interdisciplinary study of literary works as influenced and illuminated by the concepts of philosophers, historians, and scientists. Barring duplication of subject, may be repeated for credit. 4 cr.

521. THE NATURE WRITERS
Fiction, poetry, and nonfiction books on the natural environment. Such books as Thoreau's *Walden* or *Maine Woods*, Leopold's *Sand Country Almanac*, Beston's *Outermost House*, Dillard's *Pilgrim at Tinker Creek*, books by naturalists who observe nature vividly and knowingly and who write out of their concern for the environment. 4 cr.

522. AMERICAN LITERARY FOLKLORE
Folktales, songs, proverbs, beliefs, superstitions, and their use by such American authors as Irving, Hawthorne, Longfellow, Melville, Thoreau, Twain, Frost, and Faulkner; some emphasis on oral folk culture of New Hampshire. 4 cr.

523. MADNESS IN LITERATURE
How various writers depict insanity, and how they approach the problem of determining what attitudes and what behavior are truly sane. Emphasis on 19th- and 20th-century works, but works from earlier periods also considered. Euripedes' The *Bacchae*, Shakespeare's *King Lear*, Cervantes' *Don Quixote*, Hoffman's *The Golden Pot*, Dostoevsky's *Notes from the Underground*, Robbe-Grillet's *The Voyeur*, and Nabokov's *Pale Fire*. 4 cr.

525. POPULAR CULTURE IN AMERICA
Cultural expression in popular media. Verbal arts (best sellers, magazines, newspapers, speeches); some attention to television, film, comics, popular music. The multidisciplinary approach deals with historical context, cultural institutions, and distinctions between "popular arts" and "great literature." Recurrent images, situations, and themes will be investigated to see what values are celebrated and fears revealed. 4 cr.

530. INTRODUCTION TO POETRY
Twentieth-century American and British poetry. Various poetic techniques and their demonstration. 4 cr.

531. INTRODUCTION TO DRAMA
Nature and types of drama illustrated by major English, American, and (translated) European plays. How to read a play. Live and filmed performances studied as available. 4 cr.

532. INTRODUCTION TO FICTION
Modern novels and/or short stories. The ways in which fiction communicates its meanings; the tools and methods at the fiction writer's disposal, primarily as they function in individual works. 4 cr.

533. INTRODUCTION TO FILM
Film: history, techniques, and social relevance; as an art form. Comparison of film to drama and the novel. Showing and examination of works by such film makers as Bergman, Fellini, Truffaut, Kurosawa, Hitchcock, and Welles. (Also offered as ThCo 533.) 4 cr.

585. INTRODUCTION TO WOMEN IN LITERATURE
Survey of images of women in literature. Content and approach vary depending on instructor. 4 cr.

586. INTRODUCTION TO WOMEN WRITERS
Survey of women writers. Content and approach vary depending on instructor. 4 cr.

595. LITERARY TOPICS
Various faculty members investigate topics of special interest at a level appropriate for nonmajors. See department for details of current offerings. 1-4 cr.

619. CRITICAL APPROACHES TO LITERATURE
Selected methods of literary criticism applied to fiction, poetry, and/or drama with critical approaches varying from year to year. A follow-up of 519, course provides a second semester of training in critical reading and writing, examining such major modern strategies as formalist, biographical, archetypal, psychological, sociological, historical, feminist, and structuralist criticism. Prereq: Engl 519 or equivalent. 4 cr.

621, 622. NEWSWRITING
Workshops to develop reporting and writing skills. Prereq: Engl 501 or equivalent; written permission. May be repeated for credit with the approval of the department chairperson. 4 cr.

625, 626. WRITING FICTION
A workshop in the fundamental techniques of fiction writing. Student work is criticized by fellow students; individual conferences with instructor. Prereq: Engl 501 or equivalent. Written permission of instructor required for registration. May be repeated for credit with the approval of the department chairperson. 4 cr.

627, 628. WRITING POETRY
A workshop in the fundamental techniques of poetry writing. Class discussion and criticism of poems written by students. Individual conferences with instructor. Prereq: Engl 501 or equivalent. Written permission of instructor required for registration. May be repeated for credit with the approval of the department chairperson. 4 cr.

651, 652. COMPARATIVE LITERATURE
Comparative studies of major authors representative of important periods of world literary achievement. 651: Homer to Dante; common themes and the development of the epic tradition in early Western literature. 652: Renaissance to modern. Topics and approaches vary from semester to semester. 4 cr.

657. SHAKESPEARE
Ten major plays representative of the main periods of Shakespeare's career and the main types of drama which he wrote (tragedy, comedy, history). Live and filmed performances included as available. Restricted to undergraduates and designed for both English majors and students majoring in other fields. 4 cr.

685. WOMEN'S LITERARY TRADITIONS
Intensive study of theme, topics, and techniques in women's literature. Topics vary from year to year. 4 cr.

690. INTRODUCTION TO BLACK LITERATURE IN AMERICA
Selected prose, fiction, drama, and poetry. Individual works and historical-cultural background. Course will vary from year to year. 4 cr.

695, 696. SENIOR HONORS
Open to senior English majors who, in the opinion of the department, have demonstrated the capacity to do superior work; permission required. May be counted as two courses toward the ten that constitute a major in English. 4 cr. (Not offered every year.)

697, 698. SENIOR SEMINARS
Intensive study of specialized topics which vary from year to year. Enrollment in each seminar is limited to 15 so that all students can take an active part in discussion and work closely with the instructor on their papers. Exceptional sophomores and juniors may be admitted with permission of the instructor. For details, see the course description available in the department office. 4 cr. (Not offered every year.)

701, 702. ADVANCED WRITING OF FICTION
Workshop discussion of advanced writing problems and readings of students' fiction. Individual conferences with instructor. Prereq: 625, 626, or equivalent; written permission of instructor required for registration. May be repeated for credit with the approval of the department chairperson. 4 cr.

703, 704. ADVANCED NONFICTION WRITING
A workshop course for students intending to write publishable magazine articles or nonfiction books. Equal stress on research and writing techniques. Prereq: Engl 621; 622 recommended. Written permission of instructor required. May be repeated for credit with the approval of the department chairperson. 4 cr.

705, 706. ADVANCED WRITING OF POETRY
Workshop discussion of advanced writing problems and submitted poems. Individual conferences with instructor. Prereq: Engl 627, 628, or equivalent. Written permission of instructor required for registration. May be repeated for credit with the approval of the department chairperson. 4 cr.

707. FORM AND THEORY OF FICTION
A writer's view of the forms, techniques, and theories of fiction. The novels, short stories, and works of criticism studied will vary, depending on the instructor. 4 cr.

708. FORM AND THEORY OF NONFICTION
A writer's view of contemporary nonfiction, emphasizing the choices the writer faces in the process of research and writing. 4 cr. (Not offered every year.)

709. FORM AND THEORY OF POETRY
A writer's view of the problems, traditions, and structures of poetry. 4 cr.

710. TEACHING WRITING
An introduction to various methods of teaching writing. Combines a review of theories, methods, and texts with direct observation of teaching practice. 4 cr.

712. CRITICAL ANALYSIS OF EXPOSITION
For the English teaching major; students analyze essays and write nonfiction prose. Variety of critical approaches; several methods of teaching composition. 4 cr. (Not offered every year.)

713, 714. LITERARY CRITICISM
Major critics from Plato to the present; the chief critical approaches to literature. 4 cr. (Not offered every year.)

715. APPLIED LINGUISTICS
Methods of teaching and learning foreign languages; background work on theories of language acquisition; the methodology of teaching English as a second language. Students interested in teaching other languages may do their projects on those languages. 4 cr.

716. PROBLEMS IN APPLIED LINGUISTICS
Variable topics course; problems such as language acquisition in children and adults, bilingualism, and linguistic field methods. 4 cr. (Not offered every year.)

718. ENGLISH LINGUISTICS
Introduction to the study of language; dialects and social and psychological problems of language; intensive work on the techniques of modern grammar (syntax, phonology, semantics). 4 cr. (Not offered every year.)

719. ENGLISH GRAMMAR
Traditional and contemporary approaches to the study of the structure of the English language: its history, phonology, morphology, syntax, including consideration of parts of speech, phrases, clauses, sentences, etymology, punctuation. Some emphasis on the teaching of English grammar. 4 cr.

118

720. NEWSPAPER INTERNSHIP
Students intending to pursue careers in journalism spend a semester working full- or part-time for a daily newspaper under close supervision of editors. Reporting is stressed, but students may do some editing as well. The number of internships is very limited. Prereq: Engl 621 or its equivalent; permission. 4-16 cr.

741. LITERATURE OF EARLY AMERICA
Prose and poetry of the periods of exploration, colonization, early nationalism, Puritanism, Enlightenment. Individual works and historical-cultural background. 4 cr. (Not offered every year.)

742. AMERICAN LITERATURE, 1815-1865
Fiction, nonfiction, and poetry in the period of romanticism, transcendentalism, nationalism. Individual works and cultural background. 4 cr. (Not offered every year.)

743. AMERICAN LITERATURE, 1865-1915
Fiction, nonfiction, and poetry in the period of realism, naturalism, industrialism, big money. Individual works and cultural background. 4 cr.

744. AMERICAN LITERATURE, 1915-1945
Fiction, poetry, and drama in the period of avant-garde and leftism, jazz age, and depression. Individual works and cultural background. 4 cr.

745. CONTEMPORARY AMERICAN LITERATURE
A gathering of forms, figures, and movements since 1945. Individual works and cultural background. 4 cr.

746. STUDIES IN AMERICAN DRAMA
Topics vary from year to year. Examples: 20th-century American drama; contemporary playwrights; theatricality in American life. 4 cr. (Not offered every year.)

747. STUDIES IN AMERICAN POETRY
Topics vary from year to year. Examples: poets of the open road; Pound and his followers; major American poets; contemporary American poetry. 4 cr. (Not offered every year.)

748. STUDIES IN AMERICAN FICTION
Topics vary from year to year. Examples: the romance in America; the short story, realism and naturalism; the city novel; fiction of the thirties. 4 cr.

749. MAJOR AMERICAN AUTHORS
Intensive study of two or three writers. Examples: Melville and Faulkner; Fuller, Emerson, and Thoreau; James and Wharton; Dickinson and Frost. 4 cr.

750. SPECIAL STUDIES IN AMERICAN LITERATURE
Topics vary from year to year. Examples: the Puritan heritage; ethnic literatures in America; landscape in American literature; five American lives; pragmatism; American humor; transcendentalism; women regionalists. 4 cr.

751. MEDIEVAL EPIC AND ROMANCE
The two major types of medieval narrative; comparative study of works from England, France, Germany, and Iceland, including *Beowulf, Song of Roland, Niebelungenlied,* Gottfried's *Tristan, Njal's Saga*, and Malory's *Morte d'Arthur*. All works read in modern English translations. 4 cr. (Not offered every year.)

752. HISTORY OF THE ENGLISH LANGUAGE
Evolution of English from the Anglo-Saxon period to the present day. Relations between linguistic change and literary style. 4 cr. (Not offered every year.)

753. OLD ENGLISH
Introduction to Old English language and literature through the readings of selected poetry and prose. 4 cr.

754. BEOWULF
A reading of the poem and an introduction to the scholarship. Prereq: Engl 753. 4 cr.

755, 756. CHAUCER
755: *Troilus and Criseyde*, in the context of medieval continental literature by Boccaccio and other influences. 756: *The Canterbury Tales*. 4 cr.

758. SHAKESPEARE
A few plays studied intensively. Live and filmed performances included as available. 4 cr.

759. MILTON
Milton and his age. Generous selection of Milton's prose and poetry, with secondary readings of his sources and contemporaries. 4 cr. (Not offered every year.)

763. CONTINENTAL BACKGROUNDS OF THE ENGLISH RENAISSANCE
Major philosophers, artists, and writers of the continental Renaissance (in translation): Petrarch, Ficino, Pico, Vives, Valla, Castiglione, Machiavelli, Luther, Calvin, Rabelais, Montaigne, Cervantes, Erasmus, and Thomas More, as representative of the early English Renaissance. 4 cr. (Not offered every year.)

764. PROSE AND POETRY OF THE ELIZABETHANS
Shakespeare and his contemporaries. Major works, including Spenser's *Fairie Queene*, Sidney's *Astrophil and Stella*, Shakespeare's *Sonnets*, Marlowe's *Dr. Faustus*: their literary and intellectual backgrounds. 4 cr. (Not offered every year.)

765. ENGLISH LITERATURE IN THE 17TH CENTURY
Major writers of the 17th century, including Donne, Jonson, Herbert, Bacon, and Hobbes. 4 cr. (Not offered every year.)

767, 768. LITERATURE OF THE RESTORATION AND 18TH CENTURY
Representative works; text studied closely; the ways they reflect the central intellectual problems of their age. 767: Dryden, Rochester, Restoration plays, Bunyan, Defoe, Montesquieu, and Swift. 768: Pope, Fielding, Johnson, Boswell, Voltaire, Sterne, Rousseau, Beckford, Diderot, and Blake. 4 cr.

769, 770. THE ENGLISH ROMANTIC PERIOD
Major literary trends and authors, 1798 to 1832. Focus on poetry but attention also to prose works and critical theories. 769: Wordsworth, Coleridge, Lamb, Hazlett, DeQuincey; 770: Byron, Shelley, Keats. 4 cr. (Not offered every year.)

771, 772. VICTORIAN PROSE AND POETRY
Major writers; social and cultural history. Typically included in 771, Carlyle, Ruskin, Newman, Tennyson, Browning, and others; in 772, Arnold, the pre-Raphaelites, Swinburne, Hopkins, and others. 4 cr. (Not offered every year.)

773, 774. BRITISH LITERATURE OF THE 20TH CENTURY
Poets and novelists; the concept of modernity in literature. Offerings vary by year and by instructor, but normally include such figures as Joyce, Lawrence, Yeats, Woolf, Forster, and more contemporary writers such as Burgess, Fowles, Murdoch, and Golding. 4 cr.

775. IRISH LITERATURE
Survey from the beginnings to the present; works in Irish (read in translation) such as *The Cattle Raid of Cooley*, medieval lyrics, and *Mad Sweeney*; and works in English from Swift to the present. Twentieth-century authors: Joyce, Yeats, Synge, O'Casey, Beckett, and Flann O'Brien. 4 cr. (Not offered every year.)

778. BRAIN AND LANGUAGE
An introduction to neurolinguistics, a study of how language is related to the structure of the brain. The biological foundations of linguistic universals and language acquisition. Examination of evidence from aphasia and from normal language use. 4 cr.

779. LINGUISTIC FIELD METHODS
Devoted to the study, with use of an informant, of some non-Indo-European language that is unfamiliar to both the students and the instructor at the beginning of the class. The primary aim of the course is to give students a practical introduction to linguistic analysis without the support of a text. Theoretical concepts will be introduced as needed. 4 cr.

781. ENGLISH DRAMA TO 1800
Development from the Middle Ages through the 18th century, emphasizing the Elizabethan-Jacobean contemporaries of Shakespeare (Marlowe, Jonson, Webster). Selected plays from the Middle Ages, the Restoration period, and the 18th century. 4 cr. (Not offered every year.)

782. MODERN DRAMA
Major English, American, and (translated) European plays of the modern period by such playwrights as Shaw, Ibsen, Chekhov, Strindberg, Pirandello, O'Neill, Brecht, Beckett, Williams, Miller, Pinter. Live and filmed performances studied as available. 4 cr. (Not offered every year.)

783. THE ENGLISH NOVEL OF THE 18TH CENTURY
The rise and development of the novel through study of selected major works by Defoe, Richardson, Fielding, Smollett, Sterne, and Austen. 4 cr.

784. THE ENGLISH NOVEL OF THE 19TH CENTURY
Representative novels from among Austen, Scott, Dickens, Thackeray, Emily Bronte, Charlotte Bronte, Trollope, George Eliot, Hardy, and Conrad. 4 cr.

785. MAJOR WOMEN WRITERS
Intensive study of one or more women writers. Selections vary from year to year. 4 cr.

790. SPECIAL TOPICS IN LINGUISTIC THEORY
An advanced course on a topic to be chosen by the instructor. Inquire at the English Department office for a full course description each time the course is offered. Topics such as Dialectology, Montague Grammar, African Linguistics, Linguistics and Literature, Metrics, Cross-disciplinary studies relating to linguistics. Barring duplication of subject, may be repeated for credit. 4 cr.

791-792. ENGLISH EDUCATION—PROBLEMS IN THE TEACHING OF HIGH SCHOOL ENGLISH
Methods and techniques in teaching language, composition, and literature in grades 7-12. Required of all students in the English teaching major. Open to others with permission. No credit toward the English major. 2 cr.

793. PHONETICS AND PHONOLOGY
The sounds and sound systems of English in the context of linguistic theory: comparisons of English to other languages. Prereq: a basic linguistic course or permission. 4 cr.

794. SYNTAX AND SEMANTIC THEORY
The relationship of grammar and meaning as viewed from the standpoint of modern linguistic theory. Emphasis on the syntax and semantics of English, with special attention to the construction of arguments for or against particular analyses. Prereq: a basic linguistic course or permission. 4 cr. (Not offered every year.)

795, 796. INDEPENDENT STUDY
Open to highly qualified juniors and seniors. To be elected only with permission of the department chairperson and of the supervising faculty member or members. Barring duplication of subject, may be repeated for credit up to a maximum of 16 credits. 1-16 cr.

797, 798. SPECIAL STUDIES IN LITERATURE
A) Old English Literature; B) Medieval Literature; C) 16th Century; D) 17th Century; E) 18th Century; F) English Romantic Period; G) Victorian Period; H) 20th Century; I) Drama; J) Novel; K) Poetry; L) Nonfiction; M) American Literature; N) A Literary Problem. The precise topics and methods of each section will vary. Barring duplication of subject, may be repeated for credit. For details, see the course descriptions available in the English department. 4 cr.

Entomology (Ento)

CHAIRPERSON: G. Thomas Fisher
PROFESSORS: James G. Conklin, emeritus; Robert L. Blickle, emeritus
ASSOCIATE PROFESSORS: James S. Bowman, G. Thomas Fisher, R. Marcel Reeves
ASSISTANT PROFESSORS: John F. Burger, Paul C. Johnson
ADJUNCT ASSISTANT PROFESSOR: Siegfried E. Thewke

400. INSECTS: THEIR ROLE AS MAN'S GREATEST COMPETITOR
Insects and their relations to man, his environment, and his activities. Not for major credit. Mr. Fisher. 3 cr.

402. INTRODUCTORY ENTOMOLOGY
Insect structure and function, development, classification, ecology, behavior, and evolution for students in the biological sciences; importance of insects in terrestrial and aquatic ecosystems. Insect collection required. Mr. Johnson. Lab. 4 cr.

503. PRINCIPLES OF APPLIED ENTOMOLOGY
Nature of destructive and beneficial insects and the fundamentals of insect pest management in our modern society. Elective for sophs., jrs., srs. Mr. Bowman. 4 cr.

506. FOREST ENTOMOLOGY
Especially for forest resources majors. Structure, development, classification, and control of representative forest insects. Insect collection required. Mr. Reeves. Lab. 4 cr.

695. PROBLEMS IN ENTOMOLOGY
Problems and independent investigations in the various fields of basic and applied entomology. Prereq: Ento 402 and 503; permission. Staff. 2-4 cr.

704. MEDICAL ENTOMOLOGY
Survey of past and present trends in arthropod-borne diseases transmitted to human populations, emphasizing dynamics of arthropod-host-pathogen/parasite relationships, natural nidality of disease, and role of arthropods and other animals as reservoirs or vectors of disease and maintenance of zoonoses. Laboratory emphasizes survey of arthropod groups important as disease vectors or envenomizing humans. Elective for juniors and seniors. Mr. Burger. Lab. 4 cr.

120

705. SYSTEMATICS AND TAXONOMY OF INSECTS
The kinds and diversity of insects and their relationships, emphasizing methods of species and population analysis, concepts of classification and nomenclature, and application to identification. Prereq: Ento 402; Zool 412; /or permission. Mr. Burger. Lab. 4 cr. (Not offered every year.)

706. SOIL ARTHROPODS
Biology and systematics of terrestrial arthropods, with emphasis on the springtails, sowbugs, myriapods, mites, spiders, and other arachnids. Prereq: permission. Mr. Reeves. Lab. 4 cr. (Not offered every year.)

707. IMMATURE INSECTS
Identification of immature stages of insects, especially of holometabolus orders. Aquatic forms not included. Morphological features necessary for determination. Prereq: permission. Mr. Johnson. 4 cr. (Not offered every year.)

708. INSECT MORPHOLOGY
External and internal anatomy of insects. Prereq: permission. Mr. Johnson. 4 cr. (Not offered every year.)

709. AQUATIC INSECTS
Biology, ecology, and taxonomy of aquatic insects, including their role in succession and food webs of aquatic ecosystems, origin and evolution of adaptations to aquatic environments and relationship between habitat type and faunal diversity. Laboratory emphasizes qualitative and semi-quantitative sampling techniques, collection and identification of principal aquatic groups. Prereq: Ento 402 or Zool 412; permission. Mr. Burger. Lab. 4 cr. (Not offered every year.)

710. INSECT PHYSIOLOGY
Integration of insect structure and function at the cellular, tissue, and organ levels. Prereq: permission. Mr. Johnson. 4 cr. (Not offered every year.)

720. AGRICULTURAL ENTOMOLOGY
For advanced students interested in agribusiness. Economic insect pests on forage, fruit, and vegetable crops. Life cycles; damage and current methods of control. Prereq: permission. Mr. Fisher. Lab. 4 cr.

721. PRINCIPLES OF BIOLOGICAL CONTROL
Natural and applied aspects of biological control of insect and plant pests. Prereq: permission. Mr. Reeves. 4 cr. (Not offered every year.)

722. CHEMICAL CONTROL OF INSECTS
For advanced students in applied entomology. Review of the chemical compounds for insect control. Modes of pesticide entry; toxicology. Basic understanding of chemistry is desired. Prereq: permission. Mr. Fisher. Lab. 4 cr.

723. REGULATORY PEST CONTROL
For students preparing for careers dealing directly with or associated with the movement of agricultural commodities in internal and foreign trade. Legal documents; federal and state statutes. Prereq: basic entomology and plant pathology courses; permission. Mr. Thewke. 2 or 4 cr. (Not offered every year.)

724. STRUCTURAL PEST CONTROL
For students wishing to study household and industrial entomology. Prereq: permission. Mr. Fisher. Lab. 4 cr.

Environmental Conservation

(See Institute of Natural and Environmental Resources)

Environmental Engineering

(See pages 46, 48, and 50.)

Forest Resources

(See Institute of Natural and Environmental Resources)

French

(See Ancient and Modern Languages and Literatures)

Geography (Geog)

CHAIRPERSON: William H. Wallace
PROFESSOR: William H. Wallace
ASSOCIATE PROFESSOR: Robert G. LeBlanc
ASSISTANT PROFESSORS: Robert L.A. Adams, Alasdair D. Drysdale
ADJUNCT ASSISTANT PROFESSOR: James W. Cerny

401, 402. REGIONAL GEOGRAPHY OF THE WORLD
Major culture areas of the world and the unique integration of human and physical phenomena that produce the distinctive character of these areas. 401: Western culture areas—Europe, the Americas, Australia, and New Zealand. 402: Non-Western culture areas—Black Africa, the Dry World, Oriental Asia, and the Pacific. 4 cr.

473. THE WEATHER
The elements and controls of weather; interpreting the nature and variability of New England weather. 4 cr.

512. GEOGRAPHY OF CANADA
Historical and regional geography of Canada. Historical growth; development of its distinctive regions; contemporary prospects and problems. Resource base, exploration, settlement, population growth, cultural contrasts, economic development, and special relationship with the U.S. Required 5-day field trip to Canada. 4 cr. (Not offered every year.)

513. GEOGRAPHY OF THE UNITED STATES
Geographical diversity of the U.S.: its physical setting, historical development, and contemporary spatial organization. Distinctive character and problems of major American regions; recent changes in economic, demographic, and social conditions. 4 cr. (Not offered every year.)

531. GEOGRAPHY OF WESTERN EUROPE AND THE MEDITERRANEAN
A regional and topical analysis of Western Europe and the Mediterranean. The geographical diversity of Europe in the context of physical setting and historical development. Present-day problems. 4 cr. (Not offered every year.)

540. GEOGRAPHY OF THE MIDDLE EAST
Environmental, cultural, political-geographic, and ecological foundations of the Middle East. Selected regional problems and issues; e.g., geographical dimensions of the Arab-Israeli conflict, oil, regional integration, economic development, urbanization, population growth, and nomadism. 4 cr.

570. INTRODUCTORY CLIMATOLOGY
Characteristics and world distribution of present climates. Climates of the past and theories of climatic change. Human adjustment to and modification of climate. 4 cr.

572. PHYSICAL GEOGRAPHY
Factors in the formation and distribution of landforms, soils, and vegetation. Human significance of nature. Lab. 4 cr. (Not offered every year.)

581. CULTURAL GEOGRAPHY
Differentiation of the world in terms of population, race, language, religion, and economy. Historical origin and diffusion of these phenomena. 4 cr. (Not offered every year.)

582. ECONOMIC GEOGRAPHY
Areal variation of the earth in terms of production, exchange, and consumption of economic goods. Development and application of various theories of location. 4 cr. (Not offered every year.)

583. URBAN GEOGRAPHY
The city: spatial structure and geographical characteristics. Emphasis on the North American city and its problems: land use patterns, zoning, political fragmentation, urban physical environment, residential and occupational patterns, crime and justice, and health care delivery. 4 cr.

590. INTRODUCTORY CARTOGRAPHY
Map usage, design, and execution; special-purpose thematic maps used in scholarly papers, theses, journals, and books. 4 cr.

610. THE GEOGRAPHY OF NEW ENGLAND
Distinctive physical setting of New England; its settlement and development during the past three centuries, and present-day problems and opportunities of the region. Three required weekend field excursions near the end of the term. Prereq: permission. 4 cr. (Not offered every year.)

683. HISTORICAL GEOGRAPHY OF THE UNITED STATES
Spatial analysis of Indian economic life in 1492 and of European exploration, colonization, population change, economy, urbanization, and ethnicity to 1900. Geographic illusions and their significance. 4 cr. (Not offered every year.)

690. ADVANCED CARTOGRAPHY
Opportunity to pursue individual interests while sharing in the work of the instructor and other students. Map symbolization, map perception, computer mapping, map projection, surface analysis. Prereq: Geog 590 or permission. 4 cr. (Not offered every year.)

795. SPECIAL PROJECT IN GEOGRAPHY
Readings, library, archival, and field work. Primarily for geography seniors. Prereq: permission. 2 or 4 cr.

797. SEMINAR IN GEOGRAPHY
Methodology and philosophy of geography. History of geographic thought, organizing concepts, and geographic analysis. Definition and investigation of research problems. Primarily for geography seniors. 4 cr. Cr/F.

Geology

(See Earth Sciences)

German

(See Ancient and Modern Languages and Literatures)

Greek

(See Ancient and Modern Languages and Literatures)

Health Administration and Planning (HAP)

CHAIRPERSON: Lee F. Seidel
PROFESSOR: Basil J. F. Mott
ADJUNCT PROFESSOR: Wayne C. Patterson
ASSOCIATE PROFESSOR: David E. Berry
ADJUNCT ASSOCIATE PROFESSORS: James W. Heaton, Donald E. Nicoll, Peter H. Patterson, Gerald Taube
ASSISTANT PROFESSORS: Marc D. Hiller, Michael J. O'Sullivan, Lee F. Seidel

401. HEALTH CARE SYSTEMS
Nature and functions of health care services and health professionals; impact of social, political, economic, legal, and technological forces. Current health problems. 4 cr.

402. PUBLIC HEALTH AND HUMAN ECOLOGY
Health dimension of human interaction with physical and social environments, and analysis of the problematic relationships; investigation of public health services at various levels of government. 4 cr.

401A, 402A. SEMINAR ON HEALTH AND MEDICAL CARE SYSTEMS
Focuses on health and how interactions between physical and social environment affect health; nature and function of medical care and public health services including impact of social, political, economic, legal, and technical forces. (Not open to students who have completed either HAP 401 or HAP 402.) 8 cr.

502. HEALTH AND MEDICAL CONCEPTS
Language and methodologies used by health clinicians in the prevention and treatment of disease. Efficacy of alternative interventions. Prereq: major; Biol 401 or permission. 2-4 cr.

600. SPECIAL TOPICS
Formal courses given on topical or special-interest subjects. Several topics may be taught in one year or semester. Prereq: junior standing in major or permission. 1-4 cr.

601. ADMINISTRATIVE PROBLEMS IN HEALTH ORGANIZATIONS
Means for improving administrative capacity of health organizations; application and analysis of various administrative processes and techniques in a health context. Prereq: major or permission. 2-4 cr.

611. HEALTH AND SOCIAL PLANNING
Issues and theoretical foundations common to health- and human-services planning; evolution of health planning, current organizational patterns, planning strategies, and plan development. Prereq: major or permission. 2-4 cr.

621. PREPRACTICUM SEMINAR
Preparation for field practicum experience. Prereq: major; permission. 0 cr.

622. HEALTH ADMINISTRATION AND PLANNING: FIELD PRACTICUM
Work experience in a hospital, nursing home, neighborhood health center, health-planning agency, or other health organization. Application of theories to practice. Supervision by agency personnel. Prereq: major or permission. Coreq: HAP 624. 10 cr.

624. HEALTH ADMINISTRATION AND PLANNING: POSTPRACTICUM SEMINAR
Analysis of a student's field experience and critique by classmates. Prereq: major or permission. Coreq: HAP 622. 2 cr.

695. INDEPENDENT STUDY
In-depth study with faculty supervision. Prereq: permission of major adviser and faculty of the area concerned. 2-4 cr.

122

700. HEALTH ADMINISTRATION AND PLANNING: COMPETENCY ASSESSMENT
Examination and/or evaluation to determine level of competency within the five program competency areas. Normally students will be granted up to 12 credits each for competencies A-D (generic areas) and up to 16 credits for competency E (area of specialized interest). A. Describe, analyze, and interpret the context in which health services are delivered; including social, economic, political, professional, technical, and historical dimensions; B. Describe, analyze, and interpret the nature and functions of health institutions and programs; including their planning, financing, operation, and regulation; C. Design, implement, and evaluate health policies and programs and apply sound procedures in planning and administering health programs; D. Develop and implement strategies for improving health via interaction with other human service sectors; E. Develop specialized knowledge of one or more health areas as related to institutions: hospitals and clinics, long-term care, primary care, planning, environmental health, regulation, health financing, insurance, and mental health. Prereq: major and permission. An instructor may assign an "IA" grade (continuing course) at the end of one semester. 0-64 cr. Cr/F.

701. HEALTH POLICY AND PROGRAM ANALYSIS
Applied health planning and administrative techniques. Prereq: major or permission. 2-4 cr.

702. HEALTH AND HUMAN SERVICES—INTERORGANIZATIONAL RELATIONSHIPS
Complex health problems and interorganizational response. Theories for evaluating and designing interorganizational systems. Prereq: major or permission. 2-4 cr.

704. FINANCIAL MANAGEMENT OF HEALTH-CARE INSTITUTIONS
Techniques and issues related to the financial dimension of health administration and planning. Prereq: major or permission. 2-4 cr.

732. ORGANIZATION OF HEALTH SERVICES: AN INVENTORY AND ANALYSIS
Identification and examination of institutions which comprise the health care system. Analysis of interaction of health organizations with political, economic, and other social systems. Prereq: permission. 4 cr.

793-794. SENIOR SEMINAR
Semester I: Investigation of topic of interest to student and value to health administration and planning; detailed outline of senior paper developed. Semester II: Paper written and submitted; selected seminars as necessary. Prereq: senior in major. 1 cr.

Health Studies

(See School of Health Studies)

History (Hist)

CHAIRPERSON: Charles E. Clark
PROFESSORS: Charles E. Clark, Hans Heilbronner, Charles A. Jellison, William R. Jones, David F. Long, Robert M. Mennel, Darrett B. Rutman, Douglas L. Wheeler, Donald J. Wilcox
ASSOCIATE PROFESSORS: Gibson R. Johnson, emeritus; Allan B. Partridge, emeritus; Robert C. Gilmore, Marion E. James, Allen B. Linden, Frank D. McCann, Marc L. Schwarz, Harvard Sitkoff, John O. Voll
ASSISTANT PROFESSORS: Jeffry M. Diefendorf, Judith A. Silver

401. PRESENT IN PERSPECTIVE
Selected issues in contemporary life. Modern religious, cultural, and political topics from the viewpoint of the historian in an effort to see the present in a broader perspective. Western and non-Western experiences. 4 cr.

500. INTRODUCTION TO HISTORICAL THINKING
Basic skills essential to the study of history: critical reading of historical literature, improvement of written and oral analysis of historical material, and use of library resources. Intensive study of books and documents from varying historical fields and periods. Required of history majors; open to other interested students. 4 cr.

Group I. American History

503, 504. HISTORY OF THE UNITED STATES
American history from settlement to the present. Political, social, economic, and diplomatic aspects. Not open to students who elect Hist 510. 4 cr.

505, 506. AFRO-AMERICAN HISTORY
Experiences, aspirations, and contributions of Black Americans from their ethnic origins in Africa to the present American crisis in race relations; comparative study of cultures and institutions. 4 cr.

510. HISTORICAL SURVEY OF AMERICAN CIVILIZATION
Topical survey, within broad chronological divisions, of the development of American civilization since 1600. Not open to students who elect Hist 503 or 504. 4 cr.

511. HISTORY OF NEW HAMPSHIRE
From presettlement times to the present, emphasizing the use of locally available materials and sources. 4 cr. (Not offered every year.)

703. EARLY AMERICAN HISTORY
The development of an Anglo-American society and culture along the eastern seaboard of North America, 1600-1750. 4 cr.

705, 706. AMERICA IN THE 18TH CENTURY AND THE REVOLUTION
American colonial and revolutionary history from 1740 through the adoption of the Constitution and the establishment of Washington's first administration. 4 cr.

711, 712. 19TH-CENTURY AMERICA
Domestic and international factors in the development of the American republic, its institutions and people, from the inception of the new nation in 1789 to the emergence of the United States as a world power in 1900. 4 cr.

715, 716. 20TH-CENTURY AMERICA
U.S. after 1900; cultural, political, and social factors causing major changes in American life. Semester I: progressivism through the New Deal. Semester II: World War II to the present. 4 cr.

719, 720. THE FOREIGN RELATIONS OF THE UNITED STATES
Primarily the history of American diplomacy, with attention given to the nondiplomatic aspects. Semester I: American Revolution to 1890. Semester II: 1890 to date. 4 cr.

721, 722. HISTORY OF AMERICAN THOUGHT
Significant American thinkers considered in their social context. Semester I: 1600 to 1860. Semester II: 1860 to present. 4 cr. (Not offered every year.)

724. AMERICAN URBAN HISTORY
Urbanization process from the colonial period to the present. 4 cr.

Group II. European History

521. HISTORY OF SCIENCE (TO THE RENAISSANCE)
Prehistoric techniques, Pythagoreanism and Greek rationalism, concept of the universe, neo-Platonism and the Newtonian synthesis, history of atomism. 4 cr.

522. HISTORY OF SCIENCE (POST-RENAISSANCE)
Idea of the past, evolution; matter, energy, light; rise and decline of classical physical science; history of relativity and the quantum theory. Prereq: Hist 521 or permission. 4 cr.

535. MODERN EUROPEAN HISTORY
Rise of Europe to global supremacy from the 14th to the 19th century and its transformation in the 20th century. 4 cr.

559, 560. HISTORY OF GREAT BRITAIN
History of Great Britain from the earliest times to the present; from social, constitutional, economic, political, and intellectual perspectives. Designed for history students as well as those interested in literature, western political and social systems, American studies, education, and prelaw. 4 cr.

563. INTRODUCTION TO RUSSIAN CULTURE AND CIVILIZATION
A survey course, thematically organized, drawing upon Russian and Soviet literature, history, politics, art, and ideological currents to create a composite portrait of the evolution of Russian and Soviet culture. (Also offered as Russ 563.) 4 cr.

739, 740. THREE MEDIEVAL CIVILIZATIONS
Demise of classical antiquity in the lands bordering the Mediterranean, and the genesis and fruition of three new cultural traditions: Latin Christian, Islamic, and Byzantine. Religious, literary, and scholarly survivals and innovations from 400 A.D. to 1400 A.D. 4 cr.

741. THE AGE OF THE RENAISSANCE
Renaissance from 1300 to 1600, stressing intellectual and cultural history and concentrating on events in Italy: aspects or northern Europe. 4 cr.

742. THE AGE OF REFORMATION
Northern Europe from 1300 to 1600, stressing the intellectual and cultural aspects of the European Reformation. Concentrates on the 16th century, but important trends in the 14th and 15th centuries will be given considerable attention. 4 cr.

747. FRANCE FROM LOUIS XIV TO THE FRENCH REVOLUTION
Pressures and influences which led to the French Revolution. 4 cr.

748. EUROPEAN SOCIAL CHANGE AND INDUSTRIALIZATION
Impact of the Industrial Revolution and the French Revolution on workers, peasants, middle class, and women of England, France, and Germany in the 19th century. 4 cr.

751, 752. EUROPEAN INTELLECTUAL HISTORY
European intellectual tradition from the Greek philosophers to the end of World War II. How basic ideas have developed out of previous modes of thought in response to new challenges. 4 cr.

756. 20TH-CENTURY EUROPE
World War I, European totalitarianisms, World War II, the loss of European primacy, and the search for a new Europe. 4 cr.

759. HISTORY OF MODERN SPAIN AND PORTUGAL
Iberian states and their peoples from the coming of liberalism to the present. Failure of Iberian liberalism and liberal government. Political and social change, imperial and intellectual movements, influences of Western European thought and activity. 4 cr.

761, 762. ENGLAND IN THE TUDOR AND STUART PERIODS
Political, religious, socio-economic, and intellectual forces for change at work in England from the accession of Henry VII to the revolution of 1688-89. 4 cr.

763. RUSSIA: ORIGINS TO MODERNIZATION
Russia from its foundation to emanicipation and reform. Political developments, foreign relations, intellectual and ideological currents. 4 cr.

764. RUSSIA: FROM TSARIST TO SOVIET EMPIRE
The cost of modernization; Leninist and Stalinist revolutions; Soviet consolidation. 4 cr.

767. EARLY MODERN GERMANY: REFORMATION TO THE REVOLUTION OF 1848
Conflict between Holy Roman Empire and petty states; rise of Prussia; religious conflict and Enlightenment. 4 cr.

768. MODERN GERMANY SINCE 1848
Bismarck and Imperial Germany; Weimar and the rise of Hitler; post-World War II-divided Germany. 4 cr.

Group III. Non-Western History

501. WORLD HISTORY
Major world civilizations; interrelationships in time and space among the different human societies. Social, cultural, and political factors of the human experience. 4 cr.

531, 532. LATIN-AMERICAN HISTORY
Semester I: Amerindian America and the European conquest and domination down to the last half of the 18th century. Semester II: problems of identity, integration, and nationalism, with analysis directed at selected national areas (e.g., Brazil, Mexico, Argentina, and Cuba), plus attempts at generalization. 4 cr.

575. THE ANCIENT NEAR EAST
From the neolithic revolution to the time of Alexander the Great. Rise of civilization; nature of human artistic and intellectual development in the earliest civilizations of Mesopotamia and Egypt; Judaism in its historical setting. 4 cr.

576. THE AEGEAN WORLD
History of Greece and the Aegean area from Crete to the time of Alexander the Great in 323 B.C. 4 cr.

579, 580. THE HISTORY OF CHINA AND JAPAN
Civilizations of China and Japan from their origins to the present. Semester I: traditional civilizations of China and Japan to 1800. Semester II: the modernization of China and Japan after 1800. 4 cr.

585, 586. THE HISTORY OF THE MIDDLE EAST
From the time of Muhammad to the present. Semester I: origins and expansion of Islam and the nature of medieval Islamic civilization. Semester II: Ottoman history, relations with European powers, and emergence of modern nations in the Middle East. 4 cr.

587, 588. HISTORY OF AFRICA SOUTH OF THE SAHARA
From ancient times to the present. Semester I: from prehistoric times to 1870. Semester II: from 1870 to the present. African migrations, kingdoms and societies; African responses to the slave trade; Islam; European imperialism, colonialism, and industrialization; African nationalism, independence, and postindependence problems. 4 cr.

590. THE CITY IN HISTORY
The preindustrial and modern city as a philosophical and cultural institution, with emphasis on city design and architecture. Certain great cities, such as Athens, Florence, Paris of 1900, and Berlin of the 1920s, will be dealt with in detail. 4 cr.

731. LATIN AMERICAN HISTORY: REGIONAL OR COUNTRY STUDIES
Seminar; readings and discussions of literature relative to region or country being studied. See department listing for the current semester's topic. Students will be guided through preparation of a research proposal. Hist 531, 532 recommended. 4 cr.

732. LATIN AMERICAN HISTORY: TOPICAL STUDIES
Thematic seminar; reading and discussions of literature relative to selected topics. See the department listing for the current semester. Students will be guided through preparation of a research proposal. Hist 531, 532 recommended. 4 cr.

777. THE HELLENISTIC-ROMAN WORLD
The Mediterranean and Near East from the time of Alexander to the reign of Constantine. Covers the main political and social developments, but stresses artistic, scientific, philosophical, and religious trends, with particular emphasis on the rise of Christianity, Zoroastrianism, and the general religious climate that prepared the way for Islam. 4 cr.

781. HISTORY OF MODERN CHINA, 1839-PRESENT
Modernization of China. Political, social, and cultural changes that have occurred in China from its early contacts with the West. 4 cr.

784. HISTORY OF SOUTHERN AFRICA SINCE 1820
Struggle for political and economic control in the only region of Africa where European groups remain in power. Impact of European imperialism, European-settler nationalism, racial conflict, economic competition and industrialization, apartheid, and assimilation with special attention to development of European hegemony. Official American policy. 4 cr.

785. THE MODERN MIDDLE EAST
From 18th century to the present. Problems created by modernization and reform of the traditional society; conservative reaction to reform, impact of nationalism, and appearance of new ideologies. 4 cr.

787. BLACK CONSCIOUSNESS AND PROTEST
Origins and causes of the rising consciousness and consequent activism of the peoples of Negro descent in the New World and in Africa from the early 19th century to the present. Protest literature, Black nationalism. Pan-Negroism, Pan-Africanism, negritude, the Nation of Islam, and separatist religious sects in the Americas and Africa. Crosscultural and multidisciplinary. 4 cr.

791. RELIGION IN WORLD HISTORY
The religious experience of man from the perspective of world history. The major modes of religion; development of the major religious traditions and institutions. 4 cr.

Group IV. Special Courses

595, 596. EXPLORATIONS IN HISTORY
See department listings for semester topic. 1-4 cr.

774. HISTORIOGRAPHY
Analysis of ancient and modern historians. Required of all entering Ph.D. candidates, open to undergraduates with permission. 4 cr. (Not offered every year.)

775. HISTORICAL METHODS
Contemporary historical methods. Required of all entering Ph.D. candidates; open to undergraduates with permission. 4 cr. (Not offered every year.)

789. SEMINAR IN THE HISTORY OF SCIENCE
Selected topics conducted through special lectures, individual study, oral and written reports. Subject varies. Cannot be used for credit in history without permission of the department. Prereq: permission. 4 cr.

790. QUANTIFICATION AND COMPUTERS FOR THE HISTORIAN
The historian's use of computers and statistics; practical applications of both interactive terminal operations and batch processing. Data generation and processing, computer languages (BASIC, FORTRAN), programming and library programs, elementary statistics; students will undertake operations of their own on material supplied and will consider particular quantitative studies in history in terms of techniques used. No previous knowledge of computers or college mathematics required. Prereq: admission as an undergraduate major or graduate student in history; /or permission. 4 cr.

795, 796. INDEPENDENT STUDY
A) Early American History; B) American National History; C) Canada; D) Latin America; E) Medieval History; F) Early Modern Europe; G) Modern European History; H) Ancient History; I) Far East and India; J) Near East and Africa; K) European Historiography; L) American Historiography; M) Russia; N) World History; O) English History; P) New Hampshire History; Q) Historical Methodology. For students showing a special aptitude in history who desire to study an area or subject for which no appropriate course is offered. Prereq: permission. 4 or 8 cr.

797. COLLOQUIUM IN HISTORY
Selected topics in American, European, and non-Western history. Required of history majors. Students must select section in the department office at the time of registration. 4 cr.

Home Economics (HEc)

CHAIRPERSON: Henry J. Thompson
ASSOCIATE PROFESSORS: M. Elizabeth Rand, emerita; Sarah C. Thames, emerita; Larry J. Hansen, Mary E. Holder, Victor R. Messier, Elizabeth A. Snell, Henry J. Thompson
ASSISTANT PROFESSORS: Anthony R. Tagliaferro, Mary W. Temke
INSTRUCTORS: Jill Y. Amidon, Florence P. Hansen

407. PROFESSIONAL SEMINAR
Definition and clarification of professional and educational goals in home economics. 2 cr. Cr/F.

415. BASIC CLOTHING CONSTRUCTION
Self-paced programmed instruction laboratory. Basic principles of clothing construction. 2 cr. Cr/F.

418. FOOD PREPARATION
Principles of food preparation and service; application of principles through laboratory. Prereq: HEc major. Lab fee $10. 2 cr.

419. MEAL MANAGEMENT
Planning, selection, and serving; management of time, money, and energy. Prereq: HEc major. Lab fee $7. 2 cr.

506. PRINCIPLES OF NUTRITION
Principles underlying nutrition of humans and animals; digestion, absorption, intermediate metabolism, and excretion of nutrients; function of nutrients in maintenance, growth, and production; metabolic disorders resulting from inappropriate intake of nutrients and diseases. Prereq: 1 year of chemistry; 1 semester of physiology. Mr. Parsons, Mr. Schwab. Lab. (Also offered as AnSc 506.) 4 cr.

514. TEXTILES
Textiles from raw materials through manufacturing and finishing. Fiber and fabric identification and properties as they relate to the consumer. Laboratory work with textile fibers and fabrics. Lab fee $5. 4 cr.

525. HUMAN DEVELOPMENT.
Development and behavior through the life cycle. Specific observation project required. 4 cr.

527. GUIDING CHILDREN
Current theoretical approaches to communicating with children and influencing their behavior. Weekly three-hour laboratory experience working with preschool children is required at UNH Child-Family Center. Weekly three-hour seminar. Prereq: HEc 525 and permission. 4 cr.

531. HOUSING AND DESIGN
Housing examined in terms of design, physical, socio-psychological, and community needs. 4 cr.

557. CONSUMER EDUCATION
Role and responsibility of the consumer in the marketplace, including consumer decision making. Protective role of government as it relates to the consumer. 4 cr.

573. HUMAN NUTRITION
Principles of nutrition and application to life. 4 cr.

575. NORMAL AND THERAPEUTIC NUTRITION
Principles of nutrition and application to health during the life cycle; dietary treatment of some diseases. 4 cr.

583. THE YOUNG ADULT
Effects of experience on identity formation in normal development of adolescents and young adults. 4 cr.

607. PROFESSIONAL SEMINAR
Philosophy, focus, and issues in home economics. Professional opportunities; role of home economist as an educator. 2 cr. Cr/F.

615. SPECIALIZED CLOTHING CONSTRUCTION
Process and techniques in pattern designing using the flat pattern method. Interrelated factors in fitting, design, and advanced clothing construction. Lab: application and experimentation. Prereq: HEc 415 or permission. 4 cr.

626. THE YOUNG CHILD
Examines current research relating to infant and child development. Students are provided varied experiences such as participating in small group work, interacting with parents and/or young children, researching a topic of interest within the area of child development. Prereq: HEc 525. 4 cr.

627. PRESCHOOL METHODS AND MATERIALS
Learnings appropriate for young children; methods and materials for encouraging these learnings in a developmentally sound manner. Prereq: HEc 525; HEc 527; permission. 4 cr.

657. MANAGEMENT AND DECISION MAKING IN THE FAMILY
Management concepts, including decision making applied to families. 4 cr.

671. INTRODUCTION TO FOOD SCIENCE
Experimental study of food; application of principles underlying food preparation; experimentation in comparative food preparation. Prereq: HEc 418 or equivalent; organic chemistry. Lab fee $8. 4 cr.

674. QUANTITY FOOD PURCHASING AND PRODUCTION
Principles and methods; lab experiences in selective settings. Prereq: basic food preparation; permission. 4 cr.

683. FAMILY RELATIONS
Theories and supporting research; dynamics and patterns of interaction, role behavior, and development in families. Prereq: course in behavioral sciences. 4 cr.

685. ONE SEMESTER AT THE MERRILL-PALMER INSTITUTE
Qualified juniors or seniors in child-family studies may attend the Merrill-Palmer Institute in Detroit, Michigan, for one year or one semester. Cr/F.

695. INDEPENDENT STUDY
Students with special ability in a selected area of home economics may work on a problem of special concern. Regular conferences with an adviser required. Prereq: department permission. May be repeated up to maximum total of 6 credits. 2 or 4 cr.

696. FIELD EXPERIENCE
Work with an agency, institution, or organization concerned with the welfare of families and individuals. Students will plan with department adviser and apply for approval. Students will live in or near the community in which they are working and will pay regular University tuition. Prereq: approval of faculty members and limited to HEc juniors and seniors. 8-16 cr.

707. PRACTICUM IN HOME ECONOMICS
Supervised in-depth experience with observation and participation to increase the student's understanding in a specific area of home economics. Choice of practicum from A) Child; B) Family; C) Consumer; D) Food and Nutrition. Prereq: HEc major; permission. 4 cr.

709. BIOCHEMISTRY OF NUTRITION
Intermediary metabolism of nutrients and energy; metabolism transport mechanisms; biological oxidations; interrelationships of carbohydrate, fat, and protein metabolism; obesity; control of hunger and appetite. Prereq: college course in biochemistry. Lab. (Also offered as AnSc 709.) 4 cr.

715. CLOTHING IN RELATION TO HUMAN BEHAVIOR
Research and theory in the socio-psychological aspects of clothing; clothing behavior of individuals and groups as it relates to stages of the life, cycle, culture, economics, and the phenomenon of fashion. 4 cr.

725. PRESCHOOL PROGRAMS
Organization of time, space, materials, and people to attain goals in early childhood programs. Prereq: HEc 627 or permission. 4 cr.

727. STUDENT TEACHING IN THE PRESCHOOL-KINDERGARTEN
Supervised teaching experience. Students spend 14 weeks, 18-20 hours per week, in a selected preschool working with a cooperating teacher. The student must apply at least one semester previous to the semester in which s(he) plans to student teach. Prereq: HEc major; HEc 525, 527, 626, 627, 683, 725, and 793; Educ 500 and 706; PhEd 675; ThCo 520; Math 621 or Math 622; permission. Coreq: HEc 728. 6 cr.

728. SEMINAR FOR STUDENT TEACHERS IN THE PRESCHOOL-KINDERGARTEN
Students will enrich their student teaching experience with biweekly seminars throughout the semester as a supplement to their practical experience in the field. Prereq: HEc major; HEc 525, 527, 626, 627, 683, 725, and 793; Educ 500 and 706; PhEd 675; ThCo 520; Math 621 or 622. Coreq: HEc 727. 2 cr.

754. PERSONAL AND FAMILY FINANCE
Financial alternatives available to individuals and families during stages of the family life cycle. 4 cr.

757. CONSUMER PROBLEMS
Consumer problems analyzed from the perspective of family, business, and government interests. Prereq: 8 cr. in consumer studies; permission. 4 cr.

758. CONSUMER PROTECTION
Types of protection available to consumers; investigation and evaluation of the structure and operating procedures of regulatory agencies. Prereq: permission. 4 cr.

774. CLINICAL DIETETICS
Principles of normal nutrition and physiology applied to clinical problems; altered nutrient requirements in human disease. Diet therapy as applied to clinical nutrition. Prereq: HEc 506; HEc 573; a college course in biochemistry; permission. 4 cr.

776. CONTEMPORARY ISSUES IN NUTRITION
Focus on national and worldwide nutrition concerns. Approaches and materials used in nutrition education. Prereq: HEc 573 or 575; permission. 4 cr.

786. DYNAMICS OF FAMILY CHANGE
Theories and research for the assessment of family interaction patterns; planned intervention techniques. Students examine their interaction processes and their possible effect on intervention efforts. Prereq: HEc 683; Psyc 561. 4 cr.

791. METHODS OF TEACHING HOME ECONOMICS
Home economics in the school program; curriculum materials, methods, and resources in teaching. 4 cr.

793. FAMILY LIFE EDUCATION
Critical review of current issues and literature; materials and methods for programs such as sex education and parent education. Prereq: HEc 683; permission. 4 cr.

Hotel Administration (Hotl)

PROGRAM DIRECTOR: Melvin Sandler
ASSOCIATE PROFESSORS; Richard Pew, emeritus; Melvin Sandler
ASSISTANT PROFESSORS: David A. Ley, Eric B. Orkin, Neil R. Porta
LECTURER: Marcia Schurer
ADJUNCT PROFESSOR: Ronald A. Nykiel

403. ELEMENTS OF INSTITUTIONAL ADMINISTRATION
Food service and lodging industry. Application of classroom principles through lectures, field trips, food labs, catering for on-campus functions, and participation in gourmet dinner productions. 4 cr.

550. INFORMATION PROCESSING IN HOSPITALITY MANAGEMENT
Thorough survey of fundamentals of business data processing, followed by investigation of specific applications to the field of hospitality management. Students conduct feasibility studies for area businesses. No programming is taught or required. 4 cr.

556. MANAGEMENT OF PHYSICAL STRUCTURES
Components of physical structures as functional units. Lectures, guest speakers, and specialists related to design and construction. Students develop simulated hotel/motel construction projects. 4 cr.

618. FINANCIAL ANALYSIS AND CONTROL
Managerial accounting concepts and techniques applicable to hospitality and service industries. Prereq: Admn 502. 4 cr.

655. MANAGEMENT FOR TRANSIENT, LEISURE, AND INSTITUTIONAL SERVICES
Lodging management trends and current industry issues; organization of hospitality services; management roles and functions; executive and employee selection and development. Students compare and contrast work roles of management in a large hotel. 4 cr.

667. FUNCTIONAL MANAGEMENT
Integration of management principles and techniques. Presentation of large-scale gourmet dinners; serve as consultants to on-campus food service facilities; individual research projects. Prereq: Hotl 403. 4 cr.

670. OPERATIONAL ANALYSIS IN THE HOSPITALITY INDUSTRY
Management policy decisions in the hospitality services industry, developed around "live" hospitality case situations. Students required to use their knowledge of organizational behavior, marketing, and accounting. Written analyses and oral presentations made on individual or group basis. Senior standing. 4 cr.

695. INDEPENDENT ANALYSIS
Study and research project for honor students to advance knowledge in lodging and food services fields. Prereq: senior standing and permission. 2-16 cr.

698. TOPICS IN HOTEL ADMINISTRATION
Special topics and developments in lodging and food services industries. Prereq: senior standing and permission. 4 cr.

700. MARKETS AND PROMOTION OF PUBLIC SERVICE
Provides opportunity to apply to lodging and food service industries the principles learned in basic marketing course. Lectures, guest speakers, projects. Prereq: Admn 651. 4 cr.

795. INTERNSHIP
Fieldwork in an organization for on-the-job skill development. Normally supervision is provided by a qualified individual in the organization, with frequent consultation by a faculty sponsor. A written report is required of the student. Internships may be part-time or full-time, with course credits assigned accordingly. 1-16 cr.

798. SEMINAR
Special topics in hotel administration covering material not normally covered in the regular curriculum. Prereq: permission. 1-4 cr.

Humanities (Huma)

401. INTRODUCTION TO THE HUMANITIES
Interdisciplinary study of creative arts and living ideas. Primarily for freshmen with little or no previous exposure to humanities. Multisection course on different topics. Three sections must be passed to receive credit. Sections divided into three categories: 1) practical aspects of the creative process; 2) ideas which have influenced people from ancient to modern times; 3) area studies. Cultural events included when appropriate. May be repeated for credit if different sections are taken. 4 cr.

501. HUMANITIES: THE ANCIENT WORLD
Appreciation of literature, the arts, and philosophy. Roots of Western civilization: Homer, Greek tragedy, Plato, Aristotle, the Bible, Vergil. Weekly lecture series, slides, films, visit to Boston museums. 4 cr.

502. HUMANITIES: THE MODERN WORLD
Literature, philosophy, and art from Dante through the French and Russian realists. Dante, Castiglione, Machiavelli, Montaigne, Racine, Moliere, Pope, Goethe, Wordsworth, Zola, Tolstoy. Weekly lecture series, slides, films, visit to Boston musuems. 4 cr.

503. HUMANITIES: THE 20th CENTURY
Literature, philosophies, and art of Western civilization in the last hundred years. Prereq: Huma 502, or course in history of literature, philosophy, or the arts. 4 cr.

595. SPECIAL STUDIES IN THE HUMANITIES
Selected topics not covered by existing courses, with subjects to vary. May be repeated for credit. 2 or 4 cr.

699. SENIOR PROJECT IN HUMANITIES
Independent study open only to senior humanities majors with individual project approved and supervised by faculty. 2-6 cr.

Hydrology

(See Institute of Natural and Environmental Resources)

Institute of Natural and Environmental Resources

DIRECTOR: Owen B. Durgin
PROFESSORS: James R. Bowring, emeritus; Richard A. Andrews, James P. Barrett, Paul E. Bruns, Gordon L. Byers, William H. Drew, Owen B. Durgin, Nicolas Engalichev, Bennett B. Foster, Francis R. Hall, William F. Henry, John L. Hill, Harold W. Hocker, Jr., Edmund F. Jansen, David P. Olson, Allan B. Prince
ASSOCIATE PROFESSORS: John E. Carroll, S. Lawrence Dingman, Robert D. Harter, William W. Mautz, Nobel K. Peterson, R. Marcel Reeves, Oliver P. Wallace, Silas B. Weeks, Richard R. Weyrick
ASSISTANT PROFESSORS: Robert T. Eckert, Peter H. Greenwood, Bruce E. Lindsay, Albert E. Luloff, Donald R. Miller, Roger P. Sloan
ADJUNCT PROFESSORS: George E. Frick, Nelson L. LeRay
ADJUNCT ASSOCIATE PROFESSORS: C. Anthony Federer, James W. Hornbeck, William B. Leak, Robert S. Pierce, Sidney A. L. Pilgrim, Betty H. Roberts, Charles F. Tucker
ADJUNCT ASSISTANT PROFESSOR: Peter W. Garrett
INSTRUCTOR: Kurt N. Olson

Natural and Environmental Resources (INER)

401. NATURAL AND HUMAN RESOURCES OF NEW ENGLAND
Historical and present population and settlement patterns; potential demographic patterns; changing socioeconomic, political, and cultural patterns; transportation characteristics; changing resource foundation: soils, minerals, water, air, forests, wildlife, fisheries, parks, critical natural environments, and aesthetic amenities. Outside speakers. Mr. Carroll. 2 cr.

511. COMPUTATION METHODS IN NATURAL RESOURCES
Computer programming using BASIC on remote terminals to solve forestry and other natural resource problems. No credit if Math 403 is taken. Staff. Lab. 2 cr.

528. APPLIED STATISTICS I
Development of elementary statistical techniques through the analysis of prepared data. Continuous and discrete probability distributions; distributions of sample statistics; small-sample theory; regression; correlation; nonparametrics. Permission of instructor required for upper division students. Mr. Durgin. 4 cr.

581. METHODS IN LAND SURVEYING
Principles and field methods of land surveying for the natural resource manager; measurement of distance, direction, and elevation; instrumentation and computation; legal aspects of land description and boundary. Prereq: FoRs 542 or permission. Mr. Jenkins. Lab. 4 cr.

595, 596. PROBLEMS IN NATURAL AND ENVIRONMENTAL RESOURCES
Students pursue field, laboratory, or library problems in natural and environmental resources that are not covered by other courses. A faculty consultant and a study topic must be chosen prior to registration for the course. In consultation with the faculty adviser, students are expected to select the problem area, create a bibliography for reflection, and find channels to actively pursue the topic. A professionally written paper is expected at termination of the study. May be repeated once for credit. Prereq: permission. 2-4 cr.

603, 605. ENVIRONMENTS OF NEW HAMPSHIRE
Societal and ecological modifications of New Hampshire environments from seacoast to alpine tundra, including the physical, biological, economic, and societal modifications of each system. Prereq: basic course in biology and economics; /or permission. 3 cr. (Summer Session only.)

604, 606. ENVIRONMENTS OF NEW HAMPSHIRE LAB
Techniques in collection and maintenance of plant, animal, and geologic specimens; demonstrations on the ecologic and environmental systems; use of audiovisual aids to learn the systems; and field observation and collection. Transportation fee. 2 cr.

609, 610. SEMINAR
Seminars arranged according to student needs: A) Community Development; B) Forestry; C) Hydrology; D) Resource Economics; E) Soils, F) Wildlife; G) Fire Ecology; H) Environmental Conservation; I) Coastal Zone Management. Optional lab/field trips. Staff. 1-3 cr.

611. COASTAL RESOURCE MANAGEMENT
Systematic and regional analysis of the environmental problems caused by human use and misuse of the coastal zone (estuaries, wetlands, saltmarsh, beaches); alteration, destruction, and pollution of these environments. Some emphasis on coast and shoreline of the Northeast with fieldwork. Transportation fee. Staff. 4 cr.

615. LINEAR PROGRAMMING METHODS
Setting up and solving problems by the simplex and distribution methods; variation in linear programming methods with applications; nonlinear programming, discrete programming; and solving input-output and game-theory problems. Applications to firm and aggregate economic analysis. Prereq: Elementary Matrix Algebra or permission. Mr. Andrews. 4 cr. (Offered every third semester.)

635. CONTEMPORARY CONSERVATION ISSUES
How man's technology causes biological and social conflicts when applied to wild-land resources; multiple demands of game, timber, water, minerals, and soil ecosystems vs. economic growth. Elective for all students except freshmen. Mr. Wallace, Mr. K. Olson. 4 cr.

637. PRACTICUM IN ENVIRONMENTAL CONSERVATION
Independent participation in an environmental conservation activity in the area of the student's specialization. Individual or group projects may be developed under the supervision of any faculty member within or outside INER or with supervisors in public and private agencies, upon approval of the course instructor. Research projects not acceptable. Prereq: senior standing in the Environmental Conservation program. Mr. Bruns, Mr. D. Olson. Lab. 4 cr. Cr/F. (Fall semesters only.)

701. STATISTICAL METHODS I
Analysis of variance and general linear models; measured numbers, nature of statistical evidence, sampling distributions, and principles of statistical inference; application of specific linear models to given sets of data. Prereq: upper-division undergraduate or graduate standing. Mr. Durgin. 4 cr. (Not offered every semester.)

702. NATURAL RESOURCES POLICY
Contemporary issues in the management and allocation of natural resources; impact of humans on agricultural and forest lands, water, wildlife, fisheries, and minerals; historical perspective of current resource policies. Prereq: permission. Mr. Carroll. 4 cr.

709. SOILS AND COMMUNITY PLANNING
Using a town plan and soils map, students develop reports for multiple urban and rural land-use—housing, sewage, recreation, transportation, runoff, etc. USDA soil classification system; Soil Conservation Service rating criteria; New Hampshire soils. Guest lecturers. Prereq: permission. Mr. Peterson. 2 cr.

711. STATISTICAL METHODS II
Intermediate course in statistics; basic concepts of sampling, linear models and analyses for one-way and multiway classification, factorial arrangement of treatments, multiple regression, and covariance. Computer programs used in analyzing data. Examples from environmental sciences. Prereq: INER 528 or equivalent. Mr. Barrett. 4 cr.

712. SAMPLING TECHNIQUES
Techniques of sampling finite populations in environmental sciences; choice of sampling unit and frame, estimation of sample size, confidence limits, and comparisons of sample designs. Prereq: INER 528 or equivalent. Mr. Barrett. 2-4 cr.

713. QUANTITATIVE ECOLOGY
Applied quantitative techniques: basic concepts in probability and statistics applied to ecological systems; population dynamics; spatial patterns; species abundance and diversity; classification and ordination; production; and energy and nutrient flow. Additional credit for in-depth mathematical analysis of a particular topic. Prereq: introductory courses in calculus, statistics, and ecology. Mr. Barrett. 3 or 4 cr.

718. LAW OF NATURAL RESOURCES AND ENVIRONMENT
For resource managers: the legal system pertaining to resource management, protection of the environment, and possibilities for future action. Prereq: INER 635 or REco 606 or permission. Mr. Tucker. 3 cr.

757. BASICS OF REMOTE SENSING
Fundamentals for application of photographic and nonphotographic sensors to information gathering in natural resource fields; emphasis is on the interpretation of aerial photographs. Applications to forestry, wildlife, land-use planning, earth sciences, soils, hydrology, and engineering. Transportation fee. Mr. Bruns, Mr. K. Olson. Lab. 2 cr.

758. APPLICATIONS OF REMOTE SENSING
Applications of remote sensing to the student's disciplinary interest. Student projects developed using available conventional aerial photography or other imagery. Prereq: INER 757 or equivalent. Transportation fee. Mr. K. Olson. Lab. 2 cr.

795, 796. INVESTIGATIONS
A) Resource Administration; B) Resource Management; C) Resource Policy; D) Public Laws and Resources. May be repeated. Prereq: permission. Staff. 2-4 cr.

797. FOREST RECREATION SEMINAR
Recreational use of nonurban lands; economics of public and private developments; planning for state and private recreational use, social aspects. Class project. Prereq: junior standing; permission. Staff. 4 cr.

Forest Resources (FoRs)

423. DENDROLOGY
North American forest trees: taxonomy, silvical characteristics, community relationships; major forest regions. Restricted to forest resources and wildlife management majors; others by permission of instructor. Must be taken concurrently with FoRs 425. Mr. Eckert. 2 cr.

425. FIELD IDENTIFICATION OF TREES AND SHRUBS
Identification and nomenclature of important North American trees; emphasis on trees and associated woody species of the Northeast. Forest resources and wildlife management majors must take concurrently with FoRs 423. Transportation fee. Mr. Eckert. Lab. 2 cr.

426. WOOD SCIENCE AND TECHNOLOGY
Microstructure; physical, chemical, and mechanical properties; identification of commercially important timbers; seasoning and preservation of wood; log and lumber grading; sawmill volume and grade yield study. Transportation fee. Mr. Hill. Lab. 4 cr.

500. SUMMER WORK EXPERIENCE
Work in forestry or closely related field, must be performed under professional supervision or approved by forest resources faculty. Students are responsible for arranging their own experience. (Forest resources majors only.) Staff. May be repeated. 0 cr. Cr/F.

527. SILVICS
Ecological base of silviculture; evolution and genetics of forest trees; classification of forest communities; forest environment; forest biota. Transportation fee. Prereq: Bot 411; FoRs 425 or Bot 566; Soil 501 taken concurrently. Mr. Hocker. Lab. 4 cr.

542. FORESTLAND MEASUREMENT AND MAPPING
Elementary measuring equipment and techniques; preparation of maps; public land survey; courthouse deed search. Two-week field session following spring semester. Transportation fee. (Forest resources and wildlife majors only.) Mr. Foster, Mr. Weyrick. 2 cr.

544. FOREST ECONOMICS
Supply and demand for forest products and services; forestry and the general economy; economics of the firm; forest evaluation; taxation. Prereq: a course in principles of economics. Mr. Weyrick. 4 cr.

629. SILVICULTURE
Application of ecological knowledge to the control, establishment, composition, and growth of forest stands for economic purposes. Transportation fee. Prereq: FoRs 423 and 527. Mr. Hocker. Lab. 3 cr.

630. FOREST HARVESTING AND SILVICULTURE
Harvesting and silviculture activities. Prereq: FoRs 629 or permission. Staff. Limited enrollment. 2 cr. Cr/F.

634. WILDLIFE ECOLOGY
Principles and factors affecting wildlife populations, including wildlife management techniques, population dynamics, identification, habitat requirements. Research project required. Prereq: basic course in biology, botany, or zoology; /or permission. Transportation fee. Mr. Mautz, Mr. Miller, Lab. 4 cr.

644. FOREST MENSURATION
Basic sampling techniques used in natural resource inventories including field applications. Estimates of forest growth and yield. Prereq: calculus, statistics, computer programming, and elementary land surveying. Mr. Barrett. Lab. 4 cr.

652. FOREST RESOURCES MEASUREMENTS AND MAPPING
Aerial photo type mapping and forest resources inventory: type identification and delineation, map construction, cruise design, and forest resources inventory. Two-week field session following spring semester. Transportation fee. (Forest resources majors, others by permission.) Prereq: FoRs 527 and 644. Mr. K. Olson, Mr. Barrett. 2 cr.

660. FOREST FIRE PROTECTION
Forest fire prevention, behavior, and effective control; weather phenomena; other aspects of forest damage; fire effects and use. Prereq: FoRs 527 or 629; Soil 501. Transportation fee. Mr. Weyrick. Lab. 2 cr.

672. ECOLOGICAL ENERGETICS
Flow of energy through ecological systems; thermodynamics in biological systems; photosynthesis; respiration, trophic structure; productivity; ecological efficiency; human use of energy, present and future, and the effects on energy flow in the ecosystem. Prereq: an ecology course; /or permission. Mr. Mautz. 4 cr.

695, 696. INVESTIGATIONS IN FORESTRY
A) Forest Ecology; B) Remote Sensing; C) Wood Products; D) Game Management; E) Mensuration; F) Forest Economics; G) Forest Management; H) Operations Control and Analysis; I) Recreation; J) Policy; K) Wildlife Physiology; L) Forest Genetics. Prereq: permission. Staff. 1-4 cr.

720. FOREST GENETICS
Genetics of forest tree improvement; variation in natural populations, breeding methods, physiological characters, quantitative data analysis. Prereq: PlSc 604 (Zool 604); FoRs 629; Statistics; /or permission. Transportation fee. Mr. Eckert. Lab. 3 cr. (Not offered every year.)

722. ADVANCED SILVICULTURE
Intensive silviculture of forest stands. Regeneration (e.g., alternative regeneration methods and site preparation); stand management (e.g., thinning schedules and fertilization). Prereq: FoRs 629 or equivalent; permission. Transportation fee. Mr. Hocker. 3 cr. (Not offered every year.)

734. FOREST PROTECTION SEMINAR
Discussion and special problems based on principles and techniques of forest protection. Prereq: permission. Mr. Weyrick. 3 cr.

737. GAME MANAGEMENT I
Biological characteristics, habitat requirements, research and management practices of upland game birds and big game animals. Several all-day field trips required (possibly on weekends) to New England wildlife areas. Transportation fee. Prereq: wildlife management major; /or permission. Mr. Mautz. Lab. 4 cr.

738. GAME MANAGEMENT II
Biological characteristics, habitat requirements, research and management practices of small game animals, furbearers, predators, and waterfowl. Several all-day field trips required (possibly on weekends) to New England wildlife areas. Transportation fee. Prereq: wildlife management major; /or permission. Mr. Miller. Lab. 4 cr.

745. FOREST MANAGEMENT
Forest land ownership; management objectives; forest inventory regulation and economic analysis; forest administration; professional responsibilities and opportunities. Prereq: completion of junior year in forestry curriculum. Transportation fee. Mr. Weyrick, Mr. Bruns. Lab. 4 cr.

753. OPERATIONS CONTROL AND ANALYSIS
Quantitative tools for decision making in forest resource management activities; development and analysis of cost functions, timber and stumpage valuation, forecasting, linear programming. Monte Carlo simulation, PERT. Prereq: calculus; forest economics; statistics; mensuration. Mr. Foster. Lab. 4 cr.

754. WOOD PRODUCTS MANUFACTURE AND MARKETING
Wood products from harvesting and procurement of raw material to finished product processes; management decisions, marketing, and promotion problems. Visits to harvesting operations and manufacturing plants in New England. Transportation fee. Prereq: FoRs 426; /or permission. Mr. Hill. Lab. 4 cr.

755. REGIONAL SILVICULTURE AND FOREST MANAGEMENT
Extended field trip to another forest region. Prereq: senior standing; FoRs 745; /or permission. Staff. Limited enrollment. 2 cr. Cr/F.

764. FOREST INDUSTRY ECONOMICS
Business methods and economics in the forest industry; planning for minimum cost operations and profitable use of capital in a forest enterprise. Individual projects. Prereq: senior standing; permission. Mr. Wallace. 4 cr. (Not offered every year.)

798. FOREST RESOURCES MANAGEMENT SEMINAR
The integration of demands from human population changes and needs on forest productivity through planning. The recognition of environmental quality and ecological concepts as planning criteria. Class discussions are a critical component. Prereq: FoRs 745. Mr. Wallace. Lab. 4 cr.

130

Hydrology (Hydr)

504. FRESHWATER RESOURCES
Major determinants of freshwater resources including: hydrologic cycle and water balance; precipitation; stream-flow measurement; pollution; water supply and sewage treatment; water resources development. Mr. Byers. Lab. 4 cr.

603. HYDROLOGY AND WATER MANAGEMENT
Engineering principles and the control of water; precipitation and stream-flow measurement, hydrograph development, estimating runoff from a watershed, and the design of structures to control this runoff. Instrumentation and problem analysis. Transportation fee. Mr. Byers. Lab. 4 cr.

705. PRINCIPLES OF HYDROLOGY
Physical principles important in the hydrologic cycle, including: basic equations, properties of water, movement of water in natural environments, formation of precipitation, relations between precipitation and streamflow, snow-melt, evapotranspiration, interception, infiltration, relations between groundwater and stream-flow, and hydrologic aspects of water quality. Problems of measurement and aspects of statistical treatment of hydrologic data. Transportation fee. Prereq: calculus. Mr. Dingman. Lab. 4 cr.

710. GROUNDWATER HYDROLOGY
Principles governing occurrence, location, and development of groundwater; well hydraulics, geophysical exploration, and chemical quality of water; use of fluid and electrical models; and selected problems. Basic course for hydrology majors and other qualified students. Prereq: one year of calculus. Mr. Hall. Lab. 4 cr.

795, 796. INDEPENDENT WORK IN HYDROLOGY
A) Hydrology; B) Chemistry of Water; C) Water Resource Management. Student may choose topic and faculty consultant. Staff. 1-4 cr.

Resource Economics (REco)

411. INTRODUCTION TO RESOURCE ECONOMICS
Organization and operation of the American economic system; role that resource use plays within that system. Essential elements of microeconomic principles; institutions and programs affecting resource use and the impact on environmental quality. Principles dealing with the economic operation of individual consumption and production units within the framework of supply, demand, price, and the economic principles of marginality. Major fields of resource economics are reviewed. Staff. Cannot be taken for credit after Econ 402 or equivalent. 4 cr.

501. AGRICULTURAL AND NATURAL RESOURCE PRODUCT MARKETING
Structure, organization, and performance of the business section in agriculture, forestry, and other local natural resource-based industries; commodity marketing systems; demand estimation, pricing policies, consumer characteristics, and related topics. Prereq: REco 411 or equivalent; /or permission. Mr. Andrews. 4 cr. (Offered every third semester.)

504. MANAGEMENT OF FARM AND RELATED RESOURCE-BASED BUSINESS
Planning, operation, and control of the farm with emphasis on application for the commercial farmer. Prereq: REco 411 or equivalent; /or permission. Staff. Lab. 4 cr. (Not offered every year.)

506. POPULATION, FOOD, AND RESOURCE USE IN DEVELOPING COUNTRIES
Economic, technical, cultural, social, and political factors that influence food supplies, nutrition resource use, employment, and income distribution in the developing countries; the population explosion; strategies for expanding food supplies; social and institutional constraints, strategies and policies for economic development. Prereq: REco 411, or equivalent. Mr. Jansen. 4 cr. (Offered every third semester.)

606. LAND ECONOMICS AND USE
Economic and institutional factors affecting human use of land resources; historical discussion of land ownership patterns; supply and demand; production relationships; location and resource use; benefit-cost analysis; institutional restraints and planning for more efficient use of land. The real estate market and taxation. Prereq: REco 411, or equivalent. Mr. Henry. 4 cr. (Offered every third semester.)

611. MARINE RESOURCE ECONOMICS
Economic overview of the marine environment; interactions/conflicts surrounding this multiple-use resource. Economics of fisheries; marine recreation; offshore facilities; aquaculture; waste disposal. Prereq: REco 411 or Econ 402; /or permission. Mr. Greenwood. 4 cr. (Offered every third semester.)

676. ECONOMICS OF WATER USE AND QUALITY MANAGEMENT
Economics of water use; role of government and policy agencies, water supply and demand, economic impact of water and water quality standards, alternatives in quality management, externalities, and methods of evaluation. Prereq: elementary biological or physical science (or Hydr 504); elementary economics. Mr. Andrews. 4 cr. (Offered every third semester.)

706. ECONOMICS OF RESOURCE DEVELOPMENT
Resource scarcity and theories of economic development; major resource development problems of land and natural resources, urban-rural conflicting demands, and conservation and water supply; capital needs, externalities, and market failure. Prereq: intermediate economic theory. Mr. Jansen. 4 cr. (Offered every third semester.)

710. RESOURCE ECONOMICS SEMINAR
Seminars arranged to students' needs and offered as demand warrants: A) Agricultural Economics and Food Policy; B) Rural Development; C) Marine Economics; D) Location of Economic Activity; E) Land and Water Economics; F) Quantitative Methods; G) Environmental Economics. In-depth treatment of area, including classic works. May be repeated. Staff. 2-4 cr.

756. REGIONAL ECONOMIC ANALYSIS
Concepts and methods of delineating regional economies, methods of measuring activity, regional development, and public policies. Emphasis on empirical research studies. Prereq: intermediate economic theory; /or permission. Mr. Lindsay. 4 cr. (Offered every third semester.)

795-796. INVESTIGATIONS IN RESOURCE ECONOMICS
Special assignments in readings, investigations, or field problems. May be repeated. A) Agricultural Marketing; B) Agricultural Production and Farm Management; C) Community Development; D) Economics of Human Resources; E) Economics of Population and Food; F) Land Economics; G) Marine Economics; H) Rural Economic Development; I) Regional Economics; J) Water Economics. Prereq: permission. Staff. 2-4 cr.

Community Development

507. INTRODUCTION TO COMMUNITY AND COMMUNITY DEVELOPMENT
Principal theories and methods of community and community development; skills required to help people enhance the social and economic well-being of their communities. Institutional structures; change processes; citizen participation in decision making; and problem analysis in contemporary, non-metropolitan communities in New England. Mr. Luloff. Lab. 4 cr.

508. APPLIED COMMUNITY DEVELOPMENT
Students work in an actual community, assisting individuals and groups to identify needs and problems, establish attainable and objective goals, assess requirements and resources, and formulate programs for development; methods of collection, analysis and integration of pertinent primary and secondary economic, social, political, and physical data for community development. Prereq: REco 507; /or permission. Staff. Lab. 4 cr.

614. COMMUNITY PLANNING
Community planning process in nonmetropolitan communities; practical application of planning techniques. Community components: housing, jobs, schools, recreation, transportation; community appearance and the administrative structure for planning. Use of planning tools: data gathering and analysis, the master plan, zoning and subdivision regulations, community development programs. Prereq: REco 411; REco 507; /or permission. Staff. 4 cr. (Not offered every year.)

705. PLANNED CHANGE IN NONMETROPOLITAN COMMUNITIES
Discussion and application of community development theory and principles using appropriate research methodologies. Areas of study chosen from: population growth, community planning and development, provision and distribution of services, rural-urban difference, and systems management. Emphasis on empirical research studies. Students may participate in community-development activities. May include placement in field agency. Prereq: REco 508; INCO 650 or INER 701 or equivalent; permission. (Offered in even years only.) Mr. Luloff. 4 cr.

717. LAW OF COMMUNITY PLANNING
Common law and the Constitution with respect to property law, including eminent domain, land-use planning, urban renewal, and zoning. Makes the nonlawyer aware of the influence and operation of the legal system in community development. Mr. Tucker. 4 cr.

Soil Science (Soil)

501. SOILS AND THE ENVIRONMENT
Physical, chemical, and biological aspects of soils in the environment. Labs coordinate with lectures. Transportation fee. Mr. Peterson. Lab. 4 cr.

502. SOIL-PLANT RELATIONSHIPS
Soils and the requirements for optimum growth of plants, with emphasis on nutrient availability; soil needs for meeting world food problems. Transportation fee. Mr. Peterson. Lab. 4 cr.

602. CHEMICAL ANALYSIS OF SOIL
Methods of soil chemical analysis. Prereq: quantitative analysis; permission. Mr. Harter. Lab. 2 cr.

605. MINERAL CYCLING IN TERRESTRIAL ECOSYSTEMS
How minerals, primarily plant nutrients, are cycled in soils and plants; chemical, microbiological, and physical interactions in the soil; nutrient uptake; how these nutrients are replaced in undisturbed ecosystems; how the cycles are disrupted by human activities; New Hampshire's dominant soil-plant communities; greenhouse experience and field trips. Prereq: Soil 501; Bot 411 or PlSc 421; /or permission. Mr. Harter. Transportation fee. Lab. 4 cr. (Alternate years, offered 1980-81.)

614. SOIL MANAGEMENT
Study and application of the principles of soil tillage, soil moisture control, soil fertility maintenance, and soil conservation practices to the successful management of the soil for crop production. Prereq: Soil 501. Staff. Lab. 3 cr.

701. PHYSICS OF SOILS
Soil as a physical system; textural and structural analysis of soils, water flow and retention, and heat and gas transfer; physical properties of soil and plant growth; methods of soil physical analysis. Prereq: Soil 501; /or permission. Staff. Lab. 4 cr. (Not offered 1980-81.)

702. CHEMISTRY OF SOILS
Chemical composition of soil; colloidal phenomena and the exchange and fixation of elements, cation exchange capacity and source of negative charge; inorganic reactions in soil and their effect on soil properties. Prereq: one year of college chemistry; /or permission. Mr. Harter. 3 cr.

704. SOIL CLASSIFICATION AND MAPPING
Soil genesis, morphology, classification, and mapping; major classification systems used in the U.S. and throughout the world as they relate to human uses of the soil. Prereq: Soil 501; an introductory geology course; /or permission. Transportation fee. Mr. Peterson. 4 cr.

795, 796. INDEPENDENT WORK IN SOIL SCIENCE
A) Soil-Plant Relationships; B) Physics of Soils; C) Chemistry of Soils; D) Soil Classification. Prereq: permission. 1-4 cr.

Inter-College Courses (Inco)

598, 599. INDEPENDENT WORK-STUDY
(598 off-campus, 599 on-campus). These courses enable students to pursue a semester of independent study in disciplines not within the purview of a particular department. Students select the area in which they wish to work, create their own bibliography for reflection, and find their own channels to pursue the problem actively. Students must write a proposal identifying the manner in which they intend to pursue the study, and obtain the sponsorship of a faculty member. The proposal, with the faculty sponsor's endorsement, should be submitted to the Teaching-Learning Committee of the appropriate college, via the college dean's office. Once approval of the college Teaching-Learning Committee is obtained, students must have the signature of the Teaching-Learning Council chairperson for registration purposes. For information, please contact Dr. Lydia Crowson, 201 Thompson Hall, or Dr. John G. Chaltas, Room 307A, Dimond Library, chairperson of the Teaching-Learning Council.

650. INTRODUCTORY APPLIED STATISTICS
A collection of one-credit modules, each approximately three weeks in length. Most modules require the use of the computer. The course features scheduled tutoring assistance and permits repeated attempts on exams. The following modules are usually offered each semester. Students should consult with faculty of their major department in choosing modules appropriate to their field of study. For further information regarding the course, please consult Laura Eaton, Director of the MaC Center, at 2-3576, 2-3577, or the Mathematics Department at 2-2320.

650A. Introductory Statistics
Descriptive statistics, estimation, confidence intervals, and tests of hypotheses. 1 cr.

650B. Planning an Investigation
Controlled experiments using basic experimental designs with a single treatment factor: analysis of variance. Prereq: 650A. 1 cr.

650C. Correlation and Regression
Correlation and regression analysis taught with the use of computer programs. Prereq: 650A. 1 cr.

650D. Sampling
Basic sampling concepts, estimation in common sampling procedures. Prereq: 650A. 1 cr.

650E. Chi Square and Nonparametrics
Tests of goodness-of-fit between observed and hypothesized distributions of ordinal data, basic nonparametric tests. Prereq: 650A. 1 cr.

650F. Probability
Discrete sample spaces and probability distributions, events, conditional probabilities, independence. 1 cr.

Italian

(See Ancient and Modern Languages and Literatures)

Japanese

(See Ancient and Modern Languages and Literatures)

Latin

(See Ancient and Modern Languages and Literatures)

Linguistics (Ling)

505. INTRODUCTION TO LINGUISTICS
An overview of the study of language: animal communication vs. human language, universal properties of human language, Chomsky's innateness hypothesis, language acquisition in children, dialects and language variation, language change. Includes an introduction to modern grammar (phonology, syntax, and semantics) and to scientific linguistic methodology. (Also offered as Engl 505.) 4 cr.

506. INTRODUCTION TO COMPARATIVE AND HISTORICAL LINGUISTICS
Major language families (primarily Indo-European) and the relationships among languages within a family. Diachronic studies; methods of writing; linguistic change; glottochronology; etymological studies. Some language training and Ling 505 desirable. (Also offered as Clas 506.) 4 cr.

795, 796. INDEPENDENT STUDY
A) Synchronic Linguistics; B) Diachronic Linguistics; C) Linguistic Theory. For students showing a special aptitude for linguistics who desire to pursue a line of inquiry for which no appropriate course is offered. All requests must be forwarded by the faculty sponsor to the director of the Interdepartmental Linguistics Committee. 1-4 cr.

Mathematics and Computer Science

CHAIRPERSON: M. Evans Munroe
PROFESSORS: Richard E. Johnson, emeritus; William L. Kichline, emeritus; Richard H. Balomenos, Homer F. Bechtell, Jr., David M. Burton, Arthur H. Copeland, Jr., A. Robb Jacoby, Shan S. Kuo, M. Evans Munroe, Eric A. Nordgren, James Radlow, Shepley L. Ross, Robert J. Silverman
ASSOCIATE PROFESSORS: Albert B. Bennett, Jr., R. Daniel Bergeron, William E. Bonnice, William E. Geeslin, Robert O. Kimball, Loren D. Meeker, Albert O. Shar, Samuel D. Shore, Donovan H. Van Osdol
ASSISTANT PROFESSORS: Eugene C. Freuder, Marie A. Gaudard, Donald Hadwin, Robert D. Russell

Mathematics (Math)

401. ELEMENTARY MATH I
Fractions, exponents, and radicals; factoring; linear equations; areas and volume of geometric figures. Not for credit by students with one or more years of college preparatory mathematics. 0 or 4 cr.

402. ELEMENTARY MATH II
Basic algebra covering absolute value, inequalities, quadratic equations, two-dimensional coordinate system, distance, slope, curve sketching, systems of equations, polynomials of higher order. Prereq: Math 401 or equivalent. Not for credit by students with two or more years of college preparatory mathematics. 0 or 4 cr.

405. ELEMENTARY FUNCTIONS
Understanding of mathematical concepts as a preparation for calculus. Exponential, logarithmic, and trigonometric functions; trigonometric identities and equations; inverse functions; rational functions; graphs. Prereq: Math 402 or two years of high school mathematics. Not for credit by students with 3 or more years of college preparatory mathematics. 0 or 4 cr.

419. EVOLUTION OF MATHEMATICS
Mathematics from antiquity to the present; origins of the various methods and branches. How and why mathematical concepts, such as number and geometry, evolved. Prereq: three college preparatory mathematics units. Credit toward a math major only in mathematics education. 4 cr.

420. FUNDAMENTAL MATHEMATICS
Topics selected from: logic, set theory, probability, statistics, linear algebra, linear programming, game theory, and graph theory. Not a preparation for calculus. Prereq: three college preparatory math units. No credit toward a math major. 4 cr.

425. CALCULUS I
Analytic geometry and calculus. Instruction at various paces and a special testing program for students to proceed at own pace. Prereq: at least three college preparatory math units including trigonometry. 4 cr.

426. CALCULUS II
Calculus of functions of one argument. Instruction at various paces and a special testing program for students to proceed at own pace. Prereq: Math 425. 4 cr.

527. DIFFERENTIAL EQUATIONS WITH LINEAR ALGEBRA
Linear differential equations, matrix algebra, linear transformation and change of basis, eigenvalues, linear systems, series solution of differential equations. Prereq: Math 426. 4 cr.

528. MULTIDIMENSIONAL CALCULUS
Partial differentiation; composite functions and chain rules; maxima and minima; transformations; vector algebra; vector functions; gradient, divergence, and curl; curves and surfaces; multiple, line, and surface integrals; integral theorems. Prereq: Math 527. 4 cr.

531. INTRODUCTION TO ABSTRACT MATHEMATICS
Logic and set theory with applications to the development of the real number system. Prereq: Math 426. 4 cr.

621. NUMBER SYSTEMS FOR ELEMENTARY SCHOOL TEACHERS
Counting and set concepts, whole numbers, fractions, negative numbers, real numbers, numeration systems, inductive and deductive reasoning. Mathematical laboratory approach. Prereq: permission. Major credit only for elementary mathematics education majors. 4 cr.

622. GEOMETRY FOR ELEMENTARY SCHOOL TEACHERS
Deductive systems, metric geometry, congruence, symmetry, parallelism, similarity, transformation, measurement, polygons and circles, polyhedra. Mathematical laboratory approach. Prereq: Math 621. Major credit only for elementary mathematics education majors. 4 cr.

623. TOPICS FOR ELEMENTARY SCHOOL TEACHERS
Modulo arithmetic, logic and flow charting, coordinate systems, graphing linear equations and applications, quadratic equations and applications, combinations, permutation, probability, statistics. Mathematical laboratory approach. Prereq: Math 621. Major credit only for elementary mathematics education majors. 4 cr.

636. PROBABILITY AND STATISTICS
Sample spaces (discrete only), events, combinations, conditional probability, independence, distributions, expectation, statistical description, random variables, sampling, estimation, tests, and applications. Credit toward a mathematics major only in mathematics education and option programs. 4 cr.

644. APPLIED PROBABILITY AND STATISTICS
Introductory course for students in engineering, the physical sciences, interdisciplinary mathematics programs, and computer science. Prereq: Math 425-426. Not for credit if credit received for Math 636. 4 cr.

645. APPLIED LINEAR ALGEBRA
Applied matrix theory; eigenvalue problems and their applications in mathematics, physics, and engineering; systems of linear, ordinary, differential equations. Computer methods will be used. Prereq: C S 410; Math 527-528. 4 cr.

646. ANALYSIS FOR APPLICATIONS
Initial-boundary-value problems of mathematical physics; Sturm-Liouville problems; series expansions by orthogonal functions; Green's functions; numerical methods. Prereq: C S 410; Math 527-528. 4 cr.

647. COMPLEX ANALYSIS FOR APPLICATIONS
Complex numbers; complex integration; infinite series; contour integration; conformal mapping; Fourier and Laplace transforms; Wiener-Hopf techniques. Prereq: Math 528. 4 cr.

656. INTRODUCTION TO NUMBER THEORY
Unique factorization, linear and quadratic congruences, quadratic reciprocity law, arithmetic functions, quadratic forms, introduction to algebraic numbers. Prereq: Math 531. 4 cr.

657. GEOMETRY I
Advanced approach to fundamental properties of Euclidean geometry. Prereq: Math 531. 4 cr.

658. GEOMETRY II
Systems of postulates of various geometries, geometric invariants, synthetic and analytic projective geometry, introduction to non-Euclidean geometry. Prereq: Math 531. 4 cr. (Not offered every year.)

682. NONLINEAR DIFFERENTIAL EQUATIONS
Phase plane analysis of autonomous systems; critical points; limit cycles; periodic solutions; approximate methods for second-order nonlinear equations; stability and asymptotic behavior of solutions. Prereq: Math 527. 4 cr. (Not offered every year.)

696. INDEPENDENT STUDY
Projects of interest and value to student and department. Prereq: permission of faculty supervisor and department chairperson. 1-6 cr.

698. SENIOR SEMINAR
Study and reports on special topics. Prereq: senior standing in mathematics education. 4 cr.

703. MATHEMATICS EDUCATION, K-6
Psychological theories of teaching; elementary curriculum projects; laboratory approach in teaching; survey including history, present theories, education objectives, and research. Prereq: Math 621 or equivalent. 2-4 cr.

735. PROBABILITY
Sample spaces (discrete and continuous); random variables; conditional probability; moments; binomial, Poisson, and normal distributions; limit theorems for sums of random variables. Prereq: Math 528. 4 cr.

736. STATISTICS
Sampling theory, estimation of parameters, testing of hypotheses, nonparametric methods. Prereq: Math 735. 4 cr.

745-746. FOUNDATIONS OF APPLIED MATHEMATICS I AND II
Basic concepts and techniques of applied mathematics including Fourier analysis, optimization methods, residue calculus, conformal mapping, linear operations, eigenvalue problems. Sturm-Liouville systems, analytical and numerical solution of ordinary and partial differential equations. Prereq: Math 527, 528, or equivalent. 4 cr.

753. NUMERICAL METHODS AND COMPUTERS I
Numerical analysis on computers; high-level languages, compilers; linear and nonlinear equations; interpolation, quadrature, curve fitting, system simulations, optimization techniques, finite elements, computer graphics. Selected algorithms programmed for computer solution. Prereq: C S 410; Math 527. 4 cr.

754. NUMERICAL METHODS AND COMPUTERS II
Computer solutions of ordinary and partial differential equations, finite differences vs. finite elements, eigenvalues and eigenvectors, algorithms for hidden-line graphics. Mathematical software. Prereq: C S 410; Math 527. 4 cr.

761. ABSTRACT ALGEBRA
Basic properties of groups, rings, fields and their homomorphisms. Prereq: Math 531. 4 cr.

762. LINEAR ALGEBRA
Vector spaces, linear transformations, matrices, determinants, dual spaces, eigenvalues, spectral and canonical decomposition theorems. Not for credit if credit received for Math 645. Prereq: Math 761. 4 cr.

134

764. ADVANCED ALGEBRA
Vector spaces, modules over principal ideal domains, structure of finitely generated modules, finite abelian groups, elementary theory of fields. Prereq: Math 761. 4 cr. (Not offered every year.)

767. ONE-DIMENSIONAL REAL ANALYSIS
Theory of limits, continuity, differentiability, integrability, series, uniform convergence. Prereq: Math 528; 531. 4 cr.

768. ABSTRACT ANALYSIS
Metric spaces, function spaces, theory of uniform limits. Prereq: Math 767. 4 cr. (Not offered every year.)

769. MULTIDIMENSIONAL REAL ANALYSIS
Partial derivatives, multiple integrals, line and surface integrals, Fourier series. Prereq: Math 767. 4 cr. (Not offered every year.)

776. LOGIC
Formal mathematics and formal systems. Consistency, completeness, decidability. Prereq: Math 531. 4 cr. (Not offered every year.)

784. TOPOLOGY
Connectedness, compactness, metrizability; with special emphasis on real line and plane. Prereq: Math 531. 4 cr.

785. ALGEBRAIC METHODS IN TOPOLOGY
Topology of manifolds, topological groups, homology, knot theory. Prereq: Math 784. 4 cr. (Not offered every year.)

788. COMPLEX ANALYSIS
Complex functions, sequences, limits, differentiability and Cauchy-Riemann equations, elementary functions, Cauchy's theorem and formula, Taylor's and Laurent's series, residues, conformal mapping. Not for credit if credit received for Math 647. Prereq: Math 767. 4 cr.

791. MATHEMATICS EDUCATION
Methods of teaching mathematics in the secondary school. Prereq: Educ 500. 4 cr.

Computer Science (C S)

403. INTRODUCTION TO DIGITAL COMPUTER PROGRAMMING
Development of algorithms and programs. Basic programming and programming structure utilizing FORTRAN IV language; use of an operating system, computer solution of numerical and nonnumerical problems. Intended for chemical engineering majors. No credit toward a math major. 2 cr.

410. INTRODUCTION TO COMPUTER PROGRAMMING
A set of three 2-credit modules. Introductory module, first half of the semester. Modules C and F, second half of the semester. Introductory module prerequisite for C and F. Permission required to register for less than 4 cr. 2-6 cr.

410. Introductory Programming
Basic concepts and programming; PASCAL or high-level programming language.

410C. Business Programming with COBOL
Algorithms related to business data processing, such as merging and updating of files.

410F. Scientific Programming with FORTRAN
Common numerical algorithms and programming techniques; simple linked-list data structures; problems of error in numerical computation.

611. ASSEMBLER-LANGUAGE PROGRAMMING
Assembler-language coding and programming techniques. Data representation, systems organization, program segmentation, linkage of control section, manipulation of bits or bytes, micro- and macroprogramming. Input/output using System macros. Interrupts. Prereq: C S 410. 4 cr.

612. DATA STRUCTURES AND PROCESSES
Data structure programming techniques and program structure using a higher-level language. Linear lists, strings, arrays, trees, and graphs. Symbol tables, sorting and searching techniques. Data organization, record-oriented and stream-oriented data transmission, conversion techniques, and storage allocation. Prereq: C S 410. 4 cr.

696. INDEPENDENT STUDY
Projects of interest and value to student and department. Prereq: permission of faculty supervisor and department chairperson. 1-6 cr.

710. ADVANCED PROGRAMMING SYSTEMS
Review of batch-process systems programs. Software organization; multiprogramming systems; techniques for parallel processing; multiaccessing and multiprocessing. Core management, file system design and management, and system accounting. Design of system modules and interfaces. Prereq: C S 611. 4 cr.

711. PROGRAMMING LANGUAGES AND COMPILER CONSTRUCTION
Formal definition of programming languages; specification of syntax and semantics. Global properties of algorithmic languages such as PL/I and ALGOL. Review of special purpose languages for list processing, symbol manipulation, data description and simulation; runtime representation of program and data structures; how these properties affect compilation. Prereq: C S 612. 4 cr.

713. COMPUTER GRAPHICS
Input-output and representation of pictures from hardware and software points of view; interactive techniques and their applications; development of an interactive graphics system. Prereq: permission. 4 cr.

Mechanical Engineering (M E)

CHAIRPERSON: William Mosberg
PROFESSORS: E. Howard Stolworthy, emeritus; Robert W. Corell, Richard S. Davis, Godfrey H. Savage, Charles K. Taft, Asim Yildiz
ASSOCIATE PROFESSORS: E. Eugene Allmendinger, Wayne M. Beasley, Barbaros Celikkol, Frederick C. Hochgraf, David E. Limbert, William Mosberg, Russell L. Valentine, John A. Wilson
ASSISTANT PROFESSORS: Harvard B. Emery, emeritus; M. Robinson Swift
SENIOR RESEARCH FELLOW: Musa Yildiz

401. INTRODUCTION TO MECHANICAL ENGINEERING
Goals and interactions of mechanical engineering in contemporary society. Basic concepts presented and developed as background for future course work. Lectures, case studies, and laboratories. 4 cr.

413. ENGINEERING GRAPHICS
Analysis of engineering problems using fundamentals of engineering drawing for the communication of engineering information. This course is identical with the first half of M E 441 and ends at midsemester. Lab. 2 cr.

414. ENGINEERING GRAPHICS
Analysis of engineering problems using fundamentals of descriptive geometry. This course is identical with the second half of M E 441 and starts at midsemester. Prereq: M E 413 or equivalent. Lab. 2 cr.

441. ENGINEERING GRAPHICS
Communication of engineering information and three-dimensional concepts by multiview drawings, pictorial views, sketches, and graphs; including the fundamentals of descriptive geometry. Lab. 4 cr.

503. THERMODYNAMICS I
Laws of thermodynamics and their relation to working substances. Prereq: Math 426. 4 cr.

504. THERMODYNAMICS II
Laws of thermodynamics and their application to real systems. Behavior of ideal and real media; thermodynamics of nonreactive and reactive mixtures; power and refrigeration cycles. Prereq: M E 503. 4 cr.

505. INTRODUCTION TO THERMODYNAMICS AND HEAT TRANSFER
First and second laws of thermodynamics; selected applications. Elementary topics in conductive, radiative, and convective heat transfer. Not for M E majors. Prereq: Math 425; Phys 407. 3 cr.

508. FLUID DYNAMICS
Dynamics and thermodynamics of compressible and incompressible fluid flow; behavior of fluids as expressed by hydrostatic, continuity, momentum, and energy equations. Prereq: M E 503; M E 527. 4 cr.

525. MECHANICS I
An introduction to statics. Two- and three-dimensional force systems, the concept of equilibrium, analysis of trusses and frames, centroids, bending moment and shear force diagrams, friction, and stress-strain relationships. Prereq: Math 425 and 426; Phys 407. (Also offered as CiE 525.) 3 cr.

526. MECHANICS II
An introduction to strength of materials. Analysis of members under torsion, axial, shear and bending stresses, superposition of stresses, stability of columns. Prereq: M E 525. (Also offered as CiE 526.) 3 cr.

527. MECHANICS III
An introduction to particle and rigid body dynamics. Rectilinear and curvilinear motion, translation and rotation, momentum and impulse principles, and work-energy relationships. Prereq: M E 525 or permission. (Also offered as CiE 526.) 3 cr.

541. MANUFACTURING PROCESSES AND DESIGN
Manufacturing drawings, sketching basic mechanisms found in machine shops, operation of basic machine tools. Lab. 4 cr.

561. INTRODUCTION TO MATERIALS SCIENCE
Theoretical and experimental studies of the structure and properties of solids. M E 561L required concurrently or subsequently. 3 cr.

561L. INTRODUCTION TO MATERIALS SCIENCE (LABORATORY)
Companion laboratory to M E 561. Co- or prereq: M E 561 or equivalent. 1 cr.

562. INTRODUCTION TO MATERIALS ENGINEERING
Physics and chemistry of selected processes in materials technology. Phase transformations in ceramics and ferrous alloys, sintering, solidification, semiconductor device fabrication. Extended lab hours for plant visits. Lab. 4 cr.

628. INTRODUCTION TO VIBRATIONS
Theory and application of mechanical and system vibrations. Single and multiple degrees of freedom; free and forced systems; development of closed form or approximate solutions using mathematical techniques and the computer. Introduction to continuous systems. Prereq: M E 527 or equivalent. 3 cr.

643-644. ELEMENTS OF DESIGN I AND II
Synthesis, analysis, and design of machine components, and systems. Development of engineering judgment; selection of materials: kinematic arrangements; design factors; failure criteria; fluctuating loads; design for finite and infinite life; stress concentration; finite element method; statistical methods. Prereq: ME 525; M E 526; M E 527. 4 cr.

648. INTRODUCTION TO MEASUREMENT AND EXPERIMENTAL METHODS
Required for junior M E students. Experimental methods, transducers, signal-processing instrumentation, and experimental errors. Experiments involving the static and dynamic measurements and display of mechanical variables using typical mechanical and electrical transduction and signal handling methods. Prereq: junior standing. 3 cr.

691. ECONOMIC DECISION MAKING IN ENGINEERING
Economic optimization of engineering problems. Prereq: senior standing. 3 cr.

695 A-D - 696 A-D. MECHANICAL ENGINEERING UNDERGRADUATE PROJECTS AND INDEPENDENT STUDY
Course numbers refer to topics in A) Thermal Science; B) Solid Mechanics; C) Engineering Design; and D) Materials. 2-4 cr.

697, 698. MECHANICAL ENGINEERING SEMINAR
Study and discussion of engineering topics; student-faculty participation. 1 cr.

701. MACROSCOPIC THERMODYNAMICS
Thermodynamic principles using an analytic, postulational approach and Legendre transformations to obtain thermodynamic potentials. 4 cr.

702. STATISTICAL THERMODYNAMICS
Macroscopic thermodynamic principles developed by means of microscopic analysis. Prereq: M E 503. 4 cr.

703. HEAT TRANSFER
Analysis of phenomena; steady-state and transient conduction, radiation, and convection; engineering applications. Co- or prereq: M E 508. 3 cr.

707. ANALYTICAL FLUID DYNAMICS
Development of the Navier-Stokes equations; vorticity theorems; turbulence and boundary-layer theory. Prereq: M E 508. 4 cr.

708. GAS DYNAMICS
Basic equations of motion of one-dimensional, subsonic and supersonic flows of compressible, ideal fluids. Wave phenomena. Rankine-Hugoniot relations. Linear approach to two-dimensional flow problems. Prereq: M E 508. 4 cr.

710. SOLAR HEATING SYSTEMS
Analysis and computer modeling of solar radiation as an energy source for heating. Phenomena, availability, collection, performance, and economy of solar energy for heating systems. Prereq: M E 703. 3 cr.

717. CRYOGENICS
Phenomena and processes at very low temperatures. Basic engineering sciences applied to problems of low temperature refrigeration, liquefaction, separation, and storage; transport of cryogenic fluids; measurement systems; vacuum technology. Prereq: M E 503. 4 cr.

723. ADVANCED DYNAMICS
Classical dynamics oriented to contemporary engineering applications. Review of particle dynamics. Hamilton's principle and the Lagrange equations. Kinematics and dynamics of rigid bodies, gyroscopic effects in machinery and space structures. 4 cr.

724. VIBRATION THEORY AND APPLICATIONS
Discrete vibrating systems. Linear system concepts; single-degree-of-freedom system with general excitation. Matrix theory and eigenvalue problems. Many degrees of freedom, normal mode theory for free and forced vibration. Numerical methods; inroduction to continuous systems; applications to structural and mechanical systems. Prereq: M E 628. 4 cr.

726. EXPERIMENTAL MECHANICS
Experimental methods and theoretical bases applied to measurement of stress, strain, and motion. Transmitted and scattered-light photoelasticity; strain gage applications; brittle coating and grid techniques; dynamic measurements, and associated instrumentation. 4 cr.

727. ADVANCED MECHANICS OF SOLIDS
Beams on elastic foundation, curved bars, inelastic behavior, instability, introduction to thin plates and shells, introduction to elasticity, energy methods, and numerical methods. 4 cr.

730. MECHANICAL BEHAVIOR OF MATERIALS
Elastic and inelastic behavior of materials in terms of micro- and macromechanics. Stress, strain, and constitutive relations related to recent developments in dislocation theory and other phenomena on the atomic scale and to the continuum mechanics on the macroscopic scale. Elasticity, plasticity, viscoelasticity, creep, fracture, and damping. Anisotropic and heterogenous materials. 4 cr.

737. OCEAN MECHANICS I
Ocean as a continuous medium, its mechanical and thermodynamic properties. Shallow- and deep-ocean modeling for the investigation of gravity and sound waves. Ocean subbottom and its soil mechanical and sound propagation properties. Instrumentation, rudimentary data collecting and processing procedures, and computer usage. Prereq: M E 508; 525; 526; 527; Math 527; 528. 4 cr.

738. OCEAN MECHANICS II
Ocean dynamical laws generalized to include temperature and salinity variations in the water column. Conservation laws with generalized equation of state. Air-sea interaction, energy transport phenomena, reflection from different coastal geometry, harbor resonances, internal currents. Sound reflection from subbottom, sound probing techniques to determine subbottom properties by ray theory and generalization of subbottom soil from an elastic to a viscoelastic medium. Prereq: M E 737; M E 781 desirable but not required. 4 cr.

741. FLUID CONTROL SYSTEMS
Mathematical modeling of hydraulic, pneumatic, and fluidic control elements and control systems. Methods for: 1) analysis of systems using gases or liquids as the working fluid; 2) synthesis of the parameters of the control elements used in fluid control systems; 3) design of these systems. (Also offered as E E 741.) 4 cr.

751. NAVAL ARCHITECTURE IN OCEAN ENGINEERING
Selected topics in the fundamentals of naval architecture pertinent to ocean engineering, including hydrostatic characteristics, basics of resistance and propulsion and rules and regulations for surface, semisubmersible, and submersible marine vehicles. Computer applications. Prereq: M E 508; M E 525; /or permission. 4 cr.

752. SUBMERSIBLE VEHICLE SYSTEMS DESIGN
Conceptual and preliminary design of submersible vehicle systems; submersibles, environmental factors, hydromechanic and structural principles, materials, intra/extravehicle systems, operating considerations, predesign and design procedures. Design projects selected and completed by student teams. Prereq: permission. 4 cr.

757. COASTAL ENGINEERING AND PROCESSES
Introduction to small amplitude and finite amplitude wave theories. Wave forecasting by significant wave method and wave spectrum method. Coastal processes and shoreline protection. Wave forces and wave structure interaction. Introduction to mathematical and physical modeling. Prereq: M E 508 or permission. 3 cr.

760. PHYSICAL METALLURGY I
Introduction to the electron theory of metals, intermetallic compounds, ferromagnetism, dislocations, and slip phenomena. 4 cr.

761. X-RAY DIFFRACTION
Physics of X-ray diffraction, the reciprocal lattice, lattice parameter determinations, space group identification, phase identification, characterization of preferred orientation. Lab. 4 cr.

763. MICROSTRUCTURE OF SOLIDS
Basic concepts and measurements; statistically exact expressions for points, lines, surfaces, and volumes; random, partially oriented and oriented structures; particle and grain characteristics and distributions; projected images and shape specification; practical applications. 4 cr.

766. PHYSICAL CERAMICS
Characteristics of crystalline and noncrystalline ceramic solids; defect structures; diffusion in ceramic materials; nucleation and crystal growth, spinodal decomposition, and solid-state reactions; kinetics of grain growth; sintering, and vitrification. 4 cr.

771. DYNAMIC SYSTEMS MODELING
Lumped parameter models for mechanical, electrical, fluid, thermal, and mixed systems. Time-domain solutions, frequency-response plots, matrix representations, eigenvectors, and eigenvalues are used to explore system response. Introduction to nonlinear analysis, simulation, computer applications. 3 cr.

781. MATHEMATICAL METHODS IN ENGINEERING SCIENCE I
Solution of discrete and continuous systems. Review of calculus, linear algebra, complex numbers, Fourier series, differential and partial differential equations with examples from acoustics, vibration theory, hydrodynamics, elasticity, solid mechanics, transport theory, and particle mechanics. 4 cr.

782. CONTROL SYSTEMS
Fundamental principles involved in the design and analysis of feedback control systems. Topics include stability criterion, time-domain analysis, frequency-domain analysis, and introduction to nonlinear systems. Lab. (Also offered as E E 782.) Prereq: permission. 4 cr.

793 A-D-794 A-D. SPECIAL TOPICS IN ENGINEERING
Course numbers refer to topics in A) Thermodynamics; B) Mechanics; C) Engineering Design; and D) Materials. Content of these courses may vary from year to year. 2-4 cr.

795 A-D-796 A-D. INDEPENDENT STUDY
Course numbers refer to topics in A) Thermal Science; B) Solid Mechanics; C) Engineering Design; and D) Materials. 2-4 cr.

Medical Technology (MedT)

CHAIRPERSON: Karol A. LaCroix
ASSISTANT PROFESSOR: Karol A. LaCroix
ADJUNCT ASSISTANT PROFESSORS: Robert Beck, M.D., Denis J. Carlson, M.D.
INSTRUCTOR: Sylvia Countway
ADJUNCT ASSOCIATE PROFESSORS: Trulls Brinck-Johnsen, Ph.D., E. Elizabeth French, M.D.
ADJUNCT CLINICAL INSTRUCTOR: Elizabeth A. Ward
ADJUNCT LECTURERS: James Dennett, Miriam K. Fogg, Joyce Gallagher, Ernst Schori, Robert Strohsahl, Janet Wright

401. INTRODUCTION TO MEDICAL TECHNOLOGY
Functions and responsibilities of medical technology as a unit of the health team. Lectures, films, demonstrations, and field trips. Prereq: second-semester freshman or sophomore major standing. 0 cr.

625. CLINICAL MICROSCOPY
Identification and analysis of cellular elements of peripheral blood, bone marrow, and urine; review of hemostasis principles; their relationship to the body in health and disease. Prereq: Zool 507-508. Lab. 4 cr.

696. INDEPENDENT STUDY
In-depth studies under faculty supervision. Staff. Prereq: junior standing; approval of the major adviser and the faculty of the area concerned. 2-4 cr.

720. CLINICAL MYCOLOGY-PARASITOLOGY
Clinical laboratory identification and pathology of human mycology and parasitology infections. Classification and diagnosis of clinically significant viruses. Prereq: Micr 702. Lab. 4 cr.

761. DIAGNOSTIC MICROBIOLOGY METHODS
Processing, evaluating, and identifying clinical bacteriology, mycology, and parasitic specimens. Routine methodologies and special procedures such as fluorescent techniques, antibiotic sensitivity testing, and nosocomial infections. Senior MedT majors only. 8 cr.

762. CLINICAL HEMATOLOGY
Review of routine and special hematology procedures, manual and automated methods. Lab results analyzed and interpreted in relation to diseases of the white cells, red cells, and platelets. Senior MedT majors only. 6 cr.

763. CLINICAL IMMUNOLOGY
Clinical serological techniques involving agglutination, precipitin, and hemolysin reactions. Principles and procedures of serological tests for syphilis, mononucleosis, rheumatoid factor, ASO hepatitis, rubella, etc. Senior MedT majors only. 2 cr.

764. CLINICAL CHEMISTRY
Practice in the operation, evaluation, and maintenance of automated and manual chemistry systems. Laboratory analyses of steroids, carbohydrates, proteins, lipids, biliary systems, enzymes, blood gases, isotopes, hormones, toxicology. Data analysis and quality control. Senior MedT majors only. 8 cr.

765. CLINICAL IMMUNOHEMATOLOGY
Routine and special blood bank principles and procedures. Proficiency in blood typing, antibody screening and identification, cross matching, record keeping, and component therapy. Senior MedT majors only. 6 cr.

766. CLINICAL URINALYSIS
Laboratory examination of urines and other body fluids using routine and special determinations. Senior MedT majors only. 2 cr.

Microbiology (Micr)

CHAIRPERSON: Galen E. Jones
PROFESSORS: Lawrence W. Slanetz, emeritus; William R. Chesbro, Galen E. Jones, Theodore G. Metcalf
ASSOCIATE PROFESSORS: Thomas G. Pistole, Robert M. Zsigray
ASSISTANT PROFESSORS: David L. Balkwill, Richard P. Blakemore

501. PUBLIC HEALTH MICROBIOLOGY
Cause, nature, incidence, and control of human communicable diseases. Microbiology and public health aspects of water, wastewater disposal, foods, and air. Lab (502) optional. 3 cr.

502. PUBLIC HEALTH MICROBIOLOGY LABORATORY
Laboratory techniques for identification of important pathogenic microorganisms, disease diagnosis, and bacteriological examination of water, wastewater, food, and air. (Students should register for Micr 501 concurrently.) 1 cr.

503. GENERAL MICROBIOLOGY
Principles of microbiology; morphology, physiology, genetics, and classification of bacteria and other microorganisms, and their relationships to agriculture, industry, sanitation, and infectious deseases. Prereq: Chem 401-402 or equivalent. Lab. 4 cr.

600. ENVIRONMENTAL MICROBIOLOGY
Detection, identification, and regulation of microorganisms which enhance or deteriorate the immediate human environment. Prereq: Micr 503. Lab. 4 cr.

701. TAXONOMY AND ECOLOGY
Isolation, identification, and classification of prokaryotic microorganisms by classical and newer techniques; analysis of the interplay between organism and environment based on energy metabolism and use of this to deduce a natural classification; uses of taxonomic and ecological information. Prereq: Micr 503; Bchm 601 or 656. Lab. 4 cr.

702. PATHOGENIC MICROBIOLOGY
Morphological, cultural, biochemical, serological, and pathogenic characteristics of microorganisms causing human and animal diseases. Prereq: Micr 503. Lab. 4 cr.

704. MICROBIAL GENETICS
Expression and transfer of genetic elements (chromosomal and nonchromosomal) in prokaryotic and eukaryotic microorganisms; consideration of factors influencing public health, industry, the environment, and society. Prereq: Micr 503; Bchm 601 or 656. Lab. 4 cr.

705. IMMUNOLOGY AND SEROLOGY
Defensive elements possessed by humans and animals protected against infectious microorganisms. Principles of serological techniques for recognition and identification of biological materials including microorganisms. Preparation of vaccines and production of antisera in animals. Prereq: Micr 702; permission. Lab. 4 cr.

706. VIROLOGY
Viruses, including animal and bacterial, and rickettsiae; interaction of viruses and host cells; techniques for propagation and recognition including immunologic methods; applications to infectious disease, the environment, and cancer. Prereq: Micr 702; permission. Lab. 4 cr.

707. MARINE MICROBIOLOGY
Characterization of microorganisms in the sea including taxonomy, physiology, and ecology; sampling, enumeration, distribution; and effects of marine environment upon microbial populations. Prereq: Micr 503 and organic chemistry. Lab. 4 cr.

138

708. MICROBIAL BIOGEOCHEMISTRY
Geochemical processes influenced by biochemical processes catalyzed by marine and terrestrial microorganisms; transformations of carbon, nitrogen, and other elements. Petroleum microbiology, natural gas production, sulfur formation, ferro-manganese nodules, corrosion, and fossil microorganisms. Prereq: Micr 503 and organic chemistry. Lab. 4 cr.

709. MICROBIAL CYTOLOGY TECHNIQUES
Light and electron microscopic techniques for the study of microbial cytology; theory and use of the electron microscope, sample preparation methods, photomicrography and photographic darkroom techniques, interpretation of electron micrographs. Prereq: Micr 503; permission. 4 cr.

710. MICROBIAL CYTOLOGY AND ULTRASTRUCTURE
Ultrastructure of prokaryotic and eukaryotic microorganisms. Structure and function of bacterial flagella, pili, walls, membranes, mesosomes, and cytoplasmic inclusions. Cytological features of structurally unique groups of bacteria, yeasts, fungi, and protozoa. Prereq: Micr 503. 3 cr.

712. SOIL MICROBIOLOGY
Microbial ecology of the soil environment; characteristics of major microbial groups in soil; factors affecting activity of soil microorganisms; their effects on the environment; and biological interactions which involve them. Prereq: Micr 503. Lab. 4 cr.

795, 796. PROBLEMS IN MICROBIOLOGY
Prereq: permission. 1-8 cr.

Military Science (Milt), Reserve Officers Training Corps

PROFESSOR OF MILITARY SCIENCE: Lieutenant Colonel William C. Hazen
LECTURERS: Captain Robert J. Corliss, Major Michael H. Everngam, Captain Donald E. Fowler, Captain Patrick J. Sweeney Jr.
ADMINISTRATIVE: Sergeant Major George B. Fasulo, Chief Enlisted Instructor; Master Sergeant Arthur Brooks, Operations Assistant; Sergeant First Class George W. Sweat, Chief Administrative Assistant.

413. THE DEFENSE ESTABLISHMENT AND NATIONAL SECURITY I
The Army as an element of the U.S. defense establishment and its role in national security. The ROTC program; tactical maneuver elements; combat, combat support, and combat service support branches; key internal and external relationships; current world events of significance to the Army officer. Lab (required only of cadets). 1 cr.

414. THE DEFENSE ESTABLISHMENT AND NATIONAL SECURITY II
Elements of the U.S. defense establishment and their role in national security. Major Army commands; separate operating agencies; other uniformed services; civilian agencies; interrelationships; the principle of civilian control of the military; current world events of significance to the Army officer. Lab (required only of cadets). 1 cr.

525. AMERICAN MILITARY HISTORY I
Study of the development of American military institutions, strategy, traditions and civil-military relations in war and peace from the colonial period to 1898. 2 cr.

526. AMERICAN MILITARY HISTORY II
The institutions and policies of the military during the 20th century as its role shifts from defense to prevention of war.

632. MILITARY LEADERSHIP AND MANAGEMENT
Human relations, interpersonal communications, and group interaction. Authoritarian vs. participative leadership. Self-actualization and fulfillment. Theory of teaching methods. Examination of leadership models. Lab (required only of cadets). 4 cr.

641. SEMINAR ON LEADERSHIP AND MANAGEMENT
Military team concept, and the coordination and planning necessary between elements of the team; analysis of contemporary problems; discussion of military justice system. 4 cr.

Music

CHAIRPERSON: Cleveland L. Howard
PROFESSORS: Karl H. Bratton, emeritus; Donald E. Steele, emeritus; John D. Wicks
ASSOCIATE PROFESSORS: Irving D. Bartley, emeritus; Mark B. DeVoto, Ruth S. Edwards, Stanley D. Hettinger, Cleveland L. Howard, Keith Polk, Mary H. Rasmussen, John E. Rogers, David E. Seiler, W. Niel Sir, Paul F. Verrette, John B. Whitlock, Henry J. Wing, Jr.
ASSISTANT PROFESSORS: Audrey Havsky, Christopher Kies, Robert Stibler, Peggy Vagts
LECTURERS: Steven Norsworthy, John Skelton

History, Literature, and Appreciation (Musi)

401. INTRODUCTION TO MUSIC
Fundamental approach to perceptive listening, based on a detailed study of several masterpieces representing different periods and forms. Historical perspective, but main emphasis is on confronting significant works of musical art on their own terms. Some participation in musical life of the University required. Not open to music majors. 4 cr.

402. SURVEY OF MUSIC HISTORY
Historical development of musical style in relation to the whole fabric of Western civilization. Prereq: Musi 401. Not open to music majors. 4 cr.

501-502. HISTORY AND LITERATURE OF MUSIC
Styles, forms, and techniques of composition in Western music. Required of all music majors. 4 cr.

511. SURVEY OF MUSIC IN AMERICA
From colonial times to the present, including the various European influences, the quest for an American style, and the emergence of such indigenous phenomena as jazz. 4 cr.

513. INTRODUCTION TO THE MUSIC OF AFRICA AND ASIA
Folk and classical music of various ethnic cultures, particularly those of Japan, Indian, and sub-Saharan Africa. 4 cr.

595. SPECIAL TOPICS IN MUSIC LITERATURE
Open to music majors and nonmajors; topics in areas not easily covered in historical courses. May be repeated for credit. Prereq: permission. 1-4 cr.

701. MUSIC OF THE MEDIEVAL PERIOD
Nature of the beginnings of polyphony. The preeminent influence of the church in the 13th century and the rising secular movement in the 14th. Music as a dominant force in the political and social life of the Middle Ages. 4 cr.

703. MUSIC OF THE RENAISSANCE
Works of the 15th- and 16th-century composers from Dunstable to Palestrina. 4 cr.

705. MUSIC OF THE BAROQUE
Music of Europe from de Rore to Bach. 4 cr.

707. MUSIC OF THE CLASSICAL PERIOD
Growth of musical styles and forms from early classicism through the high classicism of Haydn, Mozart, and the young Beethoven. 4 cr.

709. MUSIC OF THE ROMANTIC PERIOD
A survey of Romanticism in music from Beethoven's late period to the end of the 19th century. The works of Schubert, Berlioz, Schumann, Mendelssohn, Chopin, Wagner, Verdi, Brahms, Austrian symphonists, French pre-impressionists, and national styles in European music. 4 cr.

711. MUSIC OF THE 20TH CENTURY
Styles and techniques of composers from Debussy to the present. Special emphasis on tonal music before World War I; neoclassical trends; the emergence of atonality and serial techniques; antirationalist music; electronic music. 4 cr.

721. THE LIFE AND WORKS OF BEETHOVEN
Detailed study of Beethoven, his times, and his art as exemplified by his symphonies, piano music, chamber music, sacred music, and works for the stage. 4 cr.

732. THE ART SONG
History and literature of the solo song with piano accompaniment. Survey of national styles of the 19th and 20th centuries and deeper study of the central core of the art song—the German Lied. 4 cr.

733. SURVEY OF OPERA
History of the genre from Monteverdi to the present. Representative masterpieces by Handel, Mozart, Beethoven, Weber, Wagner, Verdi, Mussorgsky, Debussy, Berg, and others. 4 cr.

735. SURVEY OF PIANOFORTE LITERATURE
Keyboard literature from the Baroque to the present. Analysis, discussion, and illustration of works by Bach, Haydn, Mozart, Beethoven, the romantic composers, and contemporary writers. 4 cr.

795. SPECIAL STUDIES IN MUSIC
A) J. S. Bach; B) Franz Schubert; C) Debussy and Ravel; D) The World of Jazz; E) The Iconography of Western-European Musical Instruments; F) 19th-Century French Music; G) Advanced Analysis; H) Advanced Study in Electronic Music; I) Composition through Computer-generated Sound; J) Woodwind Literature; K) Brass Literature; L) String Literature; M) Medieval Performance Practice; N) Renaissance Performance Practice; O) Baroque Performance Practice; P) Classical Performance Practice; Q) 19th-Century Performance Practice; R) 20th-Century Performance Practice; S) Woodwind Repair; T) String Repair; U) Advanced Jazz Improvisation; V) Advanced Piano Pedagogy; W) Advanced Accompanying; X) Advanced Conducting; Y) Independent Study. Prereq: permission. May be repeated for credit with permission. 1-4 cr.

Performance (Musi)

Registration for musical organization courses should be completed during the registration period. All music laboratory courses may be repeated. A maximum of 8 credits earned in music laboratory may be used toward graduation.

Private lessons are based on a half hour of individual instruction per week. One semester-hour credit may be earned with one lesson per week; two or four semester hours of credit may be earned with two lessons per week (only students in the Bachelor of Music curriculum are allowed to register for four credits). Five one-hour practice periods are expected for each credit of private study. The special semester fee for lessons is $35 per half-hour lesson (this fee applies for courses numbered 541 through 550). The fee includes the use of a practice room for the required preparation.

Registration in courses of private instruction is open to all students in the University, subject to approval by the Department of Music and the instructor. Enrollment is limited in these courses. Students may register for credit in successive semesters.

441. CONCERT CHOIR—TECHNIQUES
Study and performance of classical and modern choral literature. Recommended for voice majors. Open to all students. Prereq: permission. 1 cr.

442. CHAMBER CHORUS
A mixed chorus which studies and performs sacred and secular works from the Renaissance to the present, participates with the opera workshop and with the orchestra, and serves as a nucleus for larger choral-instrumental work. Prereq: permission. 1 cr.

443. WOMEN'S CHORUS
Open to all students interested in singing the finest literature in this medium and who can fulfill the requirement of an audition. 1 cr.

444. THE NEWHAMPSHIREMEN
The male chorus of the University. Recommended for all male voice majors. Prereq: permission and audition. 1 cr. Cr/F.

445. SUMMER SESSION CHORUS AND BASIC CONDUCTING
Study and performance of the best classical and modern choral literature. Basic elements of choral conducting for elementary and secondary teachers, church choir directors, and those interested in singing. May be repeated. 1 cr.

448. OPERA WORKSHOP
Operatic singing, acting, and production techniques; performance of both complete operas and operatic excerpts. Prereq: permission. 1 cr.

450. SYMPHONY—TECHNIQUES AND LITERATURE
Presents several concerts during the year, of repertoire ranging from the great, standard symphonic literature to experimental, multi-media composition. Prereq: permission of conductor and audition. 1 cr.

451. UNH TRAINING ORCHESTRA
Designed for music education majors but open to all who wish to develop proficiency on major or secondary instruments. Ensemble experience in the basic repertoire often met in school situations for students who do not yet meet the standards required for the UNH Symphony. 1 cr.

452. UNH SYMPHONIC WIND ENSEMBLE
Open to all students. Campus concerts and New England tour. Prereq: permission and audition. 1 cr.

140

453. UNIVERSITY BAND
Original band music, transcriptions, marches, etc. For students whose program does not permit music as a major interest, but who are interested in maintaining their playing proficiency and continuing their study of music. Prereq: permission. 1 cr.

454. UNH MARCHING BAND
Open to all students; performs during home and away football games. Rehearsals conclude at the end of the football season. Prereq: permission. Students planning to remain in the band program after football season should register for Musi 452 or 453. 0 cr.

455. PIANO ENSEMBLE—TECHNIQUES AND LITERATURE
Drawing from available student instrumentalists and singers, pianists learn the art of performing in trios, duo sonatas, and two-piano works, and gain experience in Lieder accompaniment. 1 cr.

456. STRING ENSEMBLE—TECHNIQUES AND LITERATURE

457. WOODWIND ENSEMBLE—TECHNIQUES AND LITERATURE

458. BRASS ENSEMBLE—TECHNIQUES AND LITERATURE

459. PERCUSSION ENSEMBLE—TECHNIQUES AND LITERATURE

460. JAZZ ENSEMBLE—TECHNIQUES AND LITERATURE
In these five courses, groups of instrumentalists gain experience in the performance of literature for the smaller ensemble. Prereq: permission. 1 cr.

467. FUNCTIONAL PIANO
Basic instruction for music majors with no previous keyboard training. Pianoforte technique, keyboard harmony geared to the practical harmonization of simple melodies, sight-reading, transposition, and modulation. May involve both class instruction and periodic short individual lessons. Prereq: permission. 1 cr.

541. VOICE

542. PIANO

543. HARPSICHORD

544. ORGAN

545. VIOLIN, VIOLA

546. VIOLONCELLO, STRING BASS

547. WOODWIND

548. BRASS

549. PERCUSSION

550. HARP (Offered by special arrangement with the department.)

In courses 541 through 550 (private instruction in performance) presentation and material used vary with pupil. Emphasis on musical values and sound technique. As the student advances, repertory is broadened to include works of all periods. One solo performance each semester may be required. Prereq: permission. 1 or 2 lessons; 1, 2, or 4 cr.

751-752. CONDUCTING METHODS
Physical aspects, equipment of conductor, fundamental gestures and beats, baton techniques. Reading and analysis of full and condensed scores, study of transposition, psychology of rehearsal. Prereq: Musi 571-572 and junior standing. 2 cr.

754. COLLEGIUM MUSICUM
Instrumentalists and singers perform small ensemble music from all periods, with emphasis on Renaissance and baroque music. Prereq: permission. 1 cr.

Theory and Composition (Musi)

411-412. FUNDAMENTALS OF MUSIC THEORY
Elements of music theory for the non-music major; principles of musical structure, analysis, elementary written counterpoint and harmony, and ear training. May not be counted for credit toward a music major. Prereq: Ability to read music and permission of instructor. 4 cr.

471-472. THEORY I
Introduction to the tonal system; principles of voice leading and harmonic progression through the analysis, realization, and composition of one-, two-, and four-voiced textures. Concept of triad inversion and consonant diatonic harmonies of the major and minor modes. Students should register for 473-474 concurrently. Prereq: permission. 3 cr.

473-474. EAR TRAINING I
Laboratory exercises to develop aural skills; sight-singing and dictation. Students should register for Musi 471-472 concurrently. Prereg: permission. 1 cr.

571-572. THEORY II
Continuation of Musi 471-472. Compositional and analytic work stresses the treatment of dissonance within the tonal system; accessory tones, seventh chords, tonicization, modulation, basic principles of chromatic harmony, and harmonization of chorale melodies are covered. Students should register for 573-574 concurrently. Prereq: Musi 472; Musi 474; permission. 3 cr.

573-574. EAR TRAINING II
Laboratory exercises to further develop aural skills. Students should register for Musi 571-572 concurrently. Prereq: Musi 472, 474; permission. 1 cr.

771-772. COUNTERPOINT
Contrapuntal techniques of tonal music. Melodic construction and dissonance treatment through work in species counterpoint and studies in harmonic elaboration and prolongation. Analysis of selected compositions emphasizes the connection between fundamental contrapuntal techniques and the voice-leading of composition. Prereq: Musi 572 or permission. 2 cr.

773. ADVANCED COUNTERPOINT
Continuation of Musi 772. Prereq: Musi 772 or permission. 2 cr.

775-776. COMPOSITION
Construction of phrases, periods, and short compositions following classical models. Problems of text-setting. Prereq: Musi 572 or permission. 3 cr.

777. ADVANCED COMPOSITION
Continuation of Musi 776. Individual compositional projects. Prereq: Musi 776 and permission. May be repeated for credit. 3 cr.

779. ORCHESTRATION
Characteristics of band and orchestral instruments both individually and in small (homogeneous) and large (mixed) groupings. Students study scores, write arrangements, and have arrangements performed if at all possible. Some aspects of vocal writing. Prereq: Musi 572 or permission. 4 cr.

781. FORM AND ANALYSIS
Formal and textural elements; concepts and examples. Thorough analysis of smaller and larger masterworks from the standpoint of harmony, counterpoint, structural line, and formal articulation. Prereq: Musi 572 or permission. 4 cr.

785. ELECTRONIC SOUND SYNTHESIS
Part I: "traditional" or "analog" electronic sound synthesis; work with the Buchia Synthesizer in the electronic music studio. Part II: 1) elementary programming in FORTRAN, 2) the logic of computer sound syntheses, and 3) programming in MUSIC 4BF. Students will have the opportunity to run programs on a DEC KL10 computer equipped with 4-channel digital-to-analog and analog-to-digital converters. Part III: completion of a major independent study project in electronic music. Prereq: permission. 4 cr.

Music Education (MuEd)

500. EXPLORING MUSIC TEACHING
Introductory field work course for student to explore music teaching as a career. Observation, teaching, research, examination of multi-mechanical aids for music curriculum development. Coreq: Educ 500. 2 cr.

540. BEGINNING TECHNIQUES IN VOICE
Basic techniques of voice production. Individual work is emphasized. Working knowledge of an instrument required. This course is desirable for, but not restricted to, MuEd majors. Prereq: permission. 2 cr.

545, 546. BEGINNING TECHNIQUES IN STRING INSTRUMENTS
Class and individual instruction. Four hours practice per week. Training on the violin, viola, and cello. Classroom procedures, establishment of string programs, and evaluation of available methods materials. 2 cr.

595. SPECIAL PROJECTS IN MUSIC EDUCATION
Individual investigation, research, or study. Creative projects may be included. Prereq: permission. 1-4 cr.

741-742. TECHNIQUES AND METHODS IN CHORAL MUSIC
Problems in the organization and performance of high school, college, and community choruses. Techniques of choral conducting and rehearsal, repertory, and materials. 2 cr.

743. MATERIALS AND METHODS IN PIANO MUSIC
Gives potential piano teachers a coherent but flexible approach to the instruction of students of different ages and levels of talent through evaluation of methods and materials and discussion of the role of the private teacher. 2 cr.

745-746. TECHNIQUES AND METHODS IN STRING INSTRUMENTS
Class and individual instruction. Four hours of practice per week required. Intensive training on the violin, viola, cello, and double bass enables participants to perform in string ensembles. Classroom procedures, establishment of string programs, and evaluation of available methods materials. 2 cr.

747-748. TECHNIQUES AND METHODS IN WOODWIND INSTRUMENTS
Basic fundamentals of performance, class instruction, associated acoustical problems and study of woodwind literature. First semester: clarinet, flute, and saxophone. Second semester: double-reed instruments. 2 cr.

749. TECHNIQUES AND METHODS IN BRASS INSTRUMENTS
Basic course in embouchure formation, tone, tonguing, fingering, flexibility, accuracy, and range development as applied to the trumpet or baritone horn, French horn, and trombone; methods, studies, solos, and ensembles most likely to be useful with grade school, junior high school, and high school players of brass instruments. 2 cr.

751. TECHNIQUES AND METHODS IN PERCUSSION INSTRUMENTS
Basic performance skills on snare drum, timpani, mallet instruments, and other percussion instruments used in bands and orchestras. Materials and methods of instruction. 2 cr.

785. MUSIC FOR THE ELEMENTARY CLASSROOM TEACHER
Designed for the nonspecialist. Correlation and integration of music in the school curriculum, and basic skills and techniques necessary. 4 cr.

787-788. THE TEACHING OF ELEMENTARY AND MIDDLE SCHOOL MUSIC
Aims, scope, and organization of materials and activities in elementary and middle schools. Modern trends in educational philosophy; development of the child's voice; demonstration of materials and methods for the various grades. Observation and teaching in schools. 2 cr.

791-792. THE TEACHING OF SECONDARY SCHOOL MUSIC
Educational principles applied to music teaching and learning; curriculum organization for junior and senior high school. Adolescent voice, voice classification, selection of vocal and instrumental materials, and building unified concert programs. Problems of administration; management; relationship of the teacher to school and community. Observation of secondary school music programs. 2 cr.

795. SPECIAL STUDIES IN MUSIC EDUCATION
Allows upper-level students to explore individually or in groups areas related to their specific professional interests. Prereq: permission. 1-4 cr.

796. ORGANIZATION AND ADMINISTRATION OF SCHOOL MUSIC GROUPS
Problems of organizing and administering school orchestras, bands, glee clubs, choruses, and small ensembles; objectives, motivation, schedule, discipline, equipment, programs, finances, rehearsal techniques, contests and festivals, materials, personnel selection, and grades. 4 cr.

Nursing (Nurs)

CHAIRPERSON: Andrea R. Lindell
ASSOCIATE PROFESSORS: Mary L. Fernald, emerita; Marguerite F. Fogg, B. Ann Kelley, Andrea R. Lindell, Juliette D. Petillo, Rosemary Y. Wang
ASSISTANT PROFESSORS: Patricia G. Dean, Evelyn P. Fitzpatrick, Katherine D. Foster, Jean W. Goldsmith, Constance A. Hoyt, Margaret A. Rice, Martha W. Rowe, Ralene V. Shippee, Carol L. Williams
INSTRUCTORS: Jan Bennett, Linda M. Cutler, Ruth A. Eichell, Gwenyth G. Gerhard, Judith T. Lyons
LECTURER: Ruth D. Berry

402. NURSING
Current trends and issues in nursing. Personal beliefs and understandings related to practice of nursing. Significance of interpersonal and technical skills in nursing practice. Nurs majors only. 2 cr.

404. SUICIDOLOGY
Introductory course in the study of self-destructive behaviors and suicide; epidemiologic and demographic variables, theories of death and dying, related research. Emphasis on prevention, assessment, intervention, and postvention in suicide risk. Open to all students. 4 cr.

142

530. THE DYNAMICS OF ADDICTION
Dynamics of addiction from the viewpoint of a disease process. Reasons for treatments and implications of addiction to drugs, alcohol, and other bodily stimuli. Cause and effect relationships involved in addiction examined from the perspectives of the individual and society. Role implications for health care providers in relation to prevention and treatment. Open to all students, sophomore and above. 4 cr.

550. NURSING MANAGEMENT
Provides a base for understanding the concepts, principles, and skills needed to function as a nurse manager. Content includes the following functions of nursing management: planning, organizing, staffing, influencing, and controlling. 4 cr.

601. NURSING PROCESS
Concepts and theories related to nursing process applied to the individual—a bio-psycho-social being. Laboratory experiences: application of process to well individuals throughout the life cycle; focus on maintaining health in the community setting. Prereq: junior standing; Nurs major. Variable credits available only to EBORN students. 1-6 cr. (EBORN), 6 cr. (non-EBORN).

603. NURSING PROCESS APPLIED TO WELL FAMILY
Nursing process applied to well families; maintaining family health under normal stresses and adaptation to change. Laboratory experience: health maintenance of an assigned expanding family. Prereq: junior standing; Nurs major. Variable credits available only to EBORN students. 1-6 cr. (EBORN), 6 cr. (non-EBORN).

610. NURSING PROCESS DEALING WITH ENVIRONMENTAL INFLUENCES
Health care delivery system as it relates to: limited illness, leadership, change, and research. Nursing interventions with clients experiencing injuries from mechanical, thermal, chemical, and occupational stress. Laboratory experiences in hospitals and communities. Prereq: Nurs 601; Nurs 603; Nurs major. Variable credits available only to EBORN students. 1-6 cr (EBORN), 6 cr. (non-EBORN).

612. NURSING PROCESS IN LIMITED DISRUPTIONS OF WELLNESS
Nursing process applied to individuals and families coping with surgical, inflammatory, and childbearing stresses; maintenance of the transport system, internal chemical environment, and comfort. Laboratory experiences in hospitals and the community to increase understanding and proficiency. Prereq: Nurs 601; Nurs 603; Nurs major. Variable credits available only to EBORN students. 1-6 cr. (EBORN), 6 cr. (non-EBORN).

621. NURSING PROCESS IN COMPLEX DISRUPTIONS OF WELLNESS
Nursing process applied to complex bio-psycho-social disruptions and/or life-threatening situations in wellness at all developmental levels. Prereq: Nurs 610; Nurs 612; Nurs major. Variable credits available only to EBORN students. 1-6 cr. (EBORN), 6 cr. (non-EBORN).

625. NURSING PROCESS DEALING WITH COMPLEX ENVIRONMENTAL INFLUENCES
Nursing process applied to complex external stimuli affecting the individual and nursing; multiple environmental and societal factors contributing to disruptions in wellness. Prereq: Nurs 610; Nurs 612; Nurs major. Variable credits available only to EBORN students. 1-6 cr. (EBORN), 6 cr. (non-EBORN).

628. NURSING PROCESS IN MAINTAINING THE INDIVIDUAL'S OPTIMUM FUNCTION IN SOCIETY
Nursing process; collaboration and coordination within the health team to assess and promote functional health potentials of individuals at all developmental stages. Prereq: Nurs 621; Nurs 625; Nurs major. Coreq: Nurs 630. Variable credits available only to EBORN students. 1-6 cr. (EBORN), 6 cr. (non-EBORN).

630. LEADERSHIP THROUGH NURSING RESEARCH
Importance of research in clinical settings. Use of skills in leadership and change theory and application to clinical practice. Assigned projects and clinical sites. Nursing majors only. Prereq: Nurs 621; Nurs 625. Coreq: Nurs 628. 2 cr.

640. QUALITY ASSURANCE IN NURSING
Current trends toward quality assurance in fields of health and nursing; approaches to assessment and implementation of quality assurance programs in various practice settings. Prereq: senior standing major; /or permission. 4 cr.

695. INDEPENDENT STUDY
In-depth study with faculty supervision. Prereq: junior standing and approval of adviser and faculty of the area concerned. May be repeated for different topics. 2-4 cr.

Occupational Education (OcEd)

CHAIRPERSON: W. H. Annis
PROFESSORS: Samuel W. Hoitt, emeritus; William H. Annis, Maynard C. Heckel
ASSOCIATE PROFESSORS: Jesse James, emeritus; Richard L. Barker, Lewis Roberts, Jr.
ASSISTANT PROFESSOR: Gregory D. Gill
THOMPSON SCHOOL ASSISTANT PROFESSOR: Thomas A. March

415. PRINCIPLES AND PRACTICES OF AGRICULTURAL CONSTRUCTION AND MECHANIZATION
A) Metals—Technology and Fabrication I; B) Metals—Technology and Fabrication II; C) Residential Carpentry; D) Residential Electricity; E) Internal Combustion Engines—Principles and Maintenance; F) Internal Combustion Engines—Repair and Overhaul. Concentration of time on understanding the skills required, with some opportunity to observe and develop techniques for teaching and/or development of agricultural construction and mechanization programs. Prereq: permission. May be repeated up to 12 cr. 2 cr.

440. CONCEPTS OF CAREER EDUCATION
Examines the four major roles of people and how these roles apply to learning in University classes. The four roles are: 1) family member; 2) citizen; 3) worker; and 4) user of leisure time. This permits students to develop flexibility for changes that may occur in the future. Through this concept of career education students develop skills to: 1) use the concept as a teaching or learning strategy; 2) explore their individual areas for improvement; 3) relate their present and future classes to employment; and 4) enter the world of work. 4 cr.

500. OCCUPATIONAL COMPETENCY EXAMINATION AND EVALUATION
Examination and/or evaluation to determine the level of competency within occupational clusters. Restricted to OcEd majors. Prereq: permission. 0-30 cr. Cr/F.

550. PRINCIPLES OF OCCUPATIONAL EDUCATION
An examination of the principles on which occupational education and the Cooperative Extension Service are based. Includes historical and legislative development at both the state and federal levels with emphasis on current issues and problems. Required for majors and minors in OcEd. 4 cr.

650. MICROTEACHING
Organization and presentation of microlessons. Preliminary experience and practice in teaching. Variables of classroom teaching under controlled conditions. Videotaping for immediate feedback. Substitutes for Educ 703. Required for majors and minors in OcEd. Prereq: Educ 500 or permission. 1-4 cr.

695. INVESTIGATIONS IN OCCUPATIONAL EDUCATION
A) Career Education; B) Secondary Education; C) Post-Secondary Education; D) Adult Education; E) Extension Education; F) Exemplary Education; G) Cooperative Education; H) Disadvantaged and Handicapped Education. An opportunity for undergraduates to address a special problem. Prereq: permission. May be repeated. 2-4 cr.

696. FIELD EXPERIENCE
Work with an agency, institution, or organization to gain technical and/or professional competence not otherwise available. Student plans experience with departmental adviser. Credit approval subject to recommendation of faculty members and performance of student. Limited to OcEd majors and minors. Prereq: permission. May be repeated up to 16 credits. 2-16 cr.

700. WORKSHOPS IN OCCUPATIONAL EDUCATION
Modularized instruction for in-service education of teachers of vocational education and others in occupational education. May be repeated up to 8 credits. 1-2 cr.

750. SHOP ORGANIZATION AND CONTROL METHODS
Purposes: 1) to examine all facilities of vocational programs in New Hampshire to insure safety, quality instruction, and adequate use of space; 2) to examine the role of the vocational instruction relating to liability, maintenance of equipment, planning for improvements in facilities, and planning for new facilities. 4 cr.

783. CONDUCTING AND SUPERVISING ADULT EDUCATION PROGRAMS
Analysis of formal and informal adult education programs; development of strategies of program planning, instruction, evaluation, and supervision. 4 cr.

784. THE COMMUNITY-JUNIOR AND VOCATIONAL-TECHNICAL COLLEGES
Rise and development of community-junior colleges and two-year vocational-technical colleges in American education; their history, potential, philosophy, and functions. 4 cr.

785. ADVANCED METHODS AND MATERIALS OF INSTRUCTION
Organization and delivery of performance-based instruction. Provides opportunities for exploration in instructional planning, execution, evaluation, management, and guidance. Open to teachers of vocational-technical education and others by permission. Required of master's degree candidates. 4 cr.

786. CONCEPTS OF OCCUPATIONAL EDUCATION
Development of vocational-technical education in the U.S.; socio-economic influences responsible for its establishment. Federal and state requirements for secondary and post-secondary schools. Coordination of programs with general education and other vocational fields. Required of master's degree candidates. 4 cr.

787. ADMINISTRATION AND SUPERVISION OF VOCATIONAL EDUCATION
Students identify and develop competencies required of vocational administrators, using a vocational administrator task analysis which includes fair hiring and firing practices, staff development, long-range planning, federal administration for vocational programs, and evaluation of program effectiveness. Philosophy of, and federal regulations governing, vocational education. 4 cr.

791. PLANNING FOR TEACHING
Organization of materials of instruction to meet group and individual needs. Techniques of instruction, planning for teaching, function of consulting committees, working with youth groups, program evaluation. Course scheduled concurrently with Educ 694. Prereq: OcEd 650. 4 cr.

796. INVESTIGATIONS IN OCCUPATIONAL EDUCATION
A) Career Education; B) Secondary Education; C) Post-Secondary Education; D) Adult Education; E) Extension Education; F) Exemplary Programs; G) Cooperative Education Programs; H) Disadvantaged and Handicapped Education Programs. Student-selected problems in one of the areas listed. Elective after consultation with the instructor. Hours to be arranged. May be repeated. 2-4 cr.

798. OCCUPATIONAL EDUCATION SEMINAR
Discussion of current issues, problems, and research and development in OcEd. Students, faculty, and other personnel serve as discussion leaders. Required of OcEd majors and minors. 0 cr.

Occupational Therapy (OT)

CHAIRPERSON: Barbara Sussenberger
ASSOCIATE PROFESSORS: Barbara Sussenberger, Ann D. Ury, Judith D. Ward
ASSISTANT PROFESSORS: Alice E. Crow, Carol J. Gryde, Susan Latham
LECTURER: Martha Logigian (part time)
LEVEL I FIELDWORK COORDINATOR: Susan Latham
LEVEL II FIELDWORK COORDINATOR: Carol J. Gryde
MEDICAL LECTURERS: Luigi N. Dolcino, M.D.; Richard Hockman, M.D.; Kenneth Lee, M.D.; Hilary Newland, M.D.; Paul C. Young, M.D.

The following courses are for occupational therapy students; elective for others by permission of the course instructor.

510. OCCUPATIONAL THERAPY—THEORY I
Concepts and historical perspectives of the basic theories and techniques. Fundamentals of evaluation, testing, and problem solving; planning and administering treatment. Clinical observation and supervised clinical participation. Prereq: sophomore OT major. Lab. 4 cr.

512. TREATMENT MEDIA ANALYSIS I
Activity and its relationship to normal human development; teaching and supervising activities programs. Development of skills in treatment media and administration of activity programs. Minimum lab fee: $5. Prereq: OT 510 or permission. 2 cr.

515. TREATMENT MEDIA ANALYSIS II
Analysis of life tasks and human needs with an introduction to therapeutic analysis. Media explored for skill development and adaptation to treatment. Minimum laboratory fee: $12. Prereq: OT 512. Lab. 4 cr.

531. GROUP PROCESS
Dynamics and development of group relationships with emphasis on self-awareness and sensitivity to others. Comparison of normal and therapeutic groups. Group processes in practice; role development and leadership concepts. Prereq: sophomore OT major or permission. 2 cr.

581. MEDICAL CONCEPTS FOR OCCUPATIONAL THERAPISTS
Disease as a dynamic process affecting activity; medical and health models. Specific disease conditions addressed by a variety of health professionals. Prereq: Zool 507-508 or permission. 4 cr.

582. OCCUPATIONAL THERAPY—THEORY II—REHABILITATION TECHNIQUES
Techniques used by occupational therapists in rehabilitation of physically disabled clients; includes practice. Prereq: PhEd 652; OT 581. 4 cr.

583. OCCUPATIONAL THERAPY—PSYCHIATRIC FOUNDATIONS
Clinical psychiatric conditions presented by a psychiatrist through patient interviews. Recognition of psychiatric symptoms, their cause, and general treatment are emphasized in follow-up sessions. Prereq: Psyc 401 or permission. 4 cr.

588. LEVEL I FIELDWORK—THREE ONE-WEEK FIELDWORK EXPERIENCES
During sophomore, junior, and senior years, students are required to spend three weeks in a clinical setting during school breaks or summers. Written evaluation is required for each. Prereq: admission to OT program; permission. 1 cr. Cr/F.

600. DEVELOPMENTAL TASKS OF ADULTHOOD
Includes the biological and psychosocial context of development. Developmental tasks as they relate to the accomplishment of prior tasks, physiological change, socioeconomic status, and psychosocial development. Prereq: Psyc 581 or permission. 4 cr.

624-624L. OCCUPATIONAL THERAPY TREATMENT OF PSYCHOSOCIAL DYSFUNCTION
Current frames of reference for occupational therapy practice in psychiatric/mental health settings. Focuses on client evaluation and treatment methods as well as an overview of program development approaches in mental health systems. Lab. Prereq: OT 531; OT 583. 4 cr.

633. TREATMENT FOR PHYSICAL DISABILITIES
Uses problem-solving model. Opportunity to acquire beginning skills in evaluation, setting of treatment goals, and selection of treatment techniques for clients with physical disabilities. Prereq: OT 582. 4 cr.

634. LEVEL I—PHYSICAL DISABILITIES PRACTICUM
Through the use of community based programs, the student will have the opportunity to plan and implement OT treatment programs for the client with a physical disability. Prereq: OT 633. 2 cr.

636. EVALUATION TECHNIQUES FOR OCCUPATIONAL THERAPY
Basic informal and formal evaluation techniques for occupational therapy clientele. Practical experience in assessment and test interpretation for clients with varying disabilities and age levels. Prereq: C or better in OT 633, or permission. 2 cr.

691. SENIOR PROJECT—DESIGN
Design of independent study in occupational therapy. Choosing and defining a project topic. Exploration of literature and clinical/community resources; defining goals; contract with faculty adviser for approval and supervision. Prereq: senior standing in OT major. 1 cr. Cr/F.

692. SENIOR PROJECT—IMPLEMENTATION
Carrying out a Senior Project that was designed in OT 691; approved and supervised by a faculty adviser. Written report required. Prereq: OT 691. 1 cr.

695. INDEPENDENT STUDY
In-depth study with faculty supervision. Prereq: junior standing in OT major; approval of major adviser and faculty of area concerned. 2-4 cr.

697. ORGANIZATION AND ADMINISTRATION
Organization and administration of OT services. Practical problem-solving experiences. Development of fundamental research skills. Prereq: senior standing in major. 2 cr.

698. SENIOR SEMINAR
Current professional issues related to transition from the academic to the clinical fieldwork setting. Prereq: senior standing in major and permission. 1 cr. Cr/F.

711. PSYCHOSOCIAL DYSFUNCTION FIELD WORK
Supervised field experience in off-campus clinic for three-month period. Prereq: Completion of all requirements for B.S. degree in occupational therapy. Must be completed successfully to qualify to take professional certification exam. 0 cr.

712. PHYSICAL DYSFUNCTION FIELD WORK
Supervised field experience in off-campus clinic for three-month period. Prereq: Completion of all requirements for B.S. degree in occupational therapy. Must be completed successfully to qualify to take professional certification exam. 0 cr.

713. SPECIAL AREA FIELD WORK
Supervised field experience in off-campus clinic for three-month period. Prereq: completion of all requirements for B.S. degree in occupational therapy. Must be completed successfully to qualify to take professional certification exam. 0 cr.

Ocean Engineering

(See Special University Programs, page 71)

Oceanography

(See Special University Programs, page 71)

Philosophy (Phil)

CHAIRPERSON: Yutaka Yamamoto
PROFESSORS: Donald C. Babcock, emeritus; Paul T. Brockelman, Asher Moore, Duane H. Whittier
ASSOCIATE PROFESSOR: Robert C. Scharff, Yutaka Yamamoto
ASSISTANT PROFESSORS: R. Valentine Dusek, Lynn M. Lindholm, Neil B. Lubow, Barbara Tovey
LECTURER: Judith M. St. Lawrence

Introduction to Philosophy: The 400-level courses (except 495) listed below are all introductions to philosophy; students should select among them according to interest.

401. GENERAL INTRODUCTION TO PHILOSOPHY
Depending upon the instructor, the emphasis will be on basic philosophic problems, recurrent types of philosophies, or selected readings from the history of philosophy. 4 cr.

412. BEGINNING LOGIC
Principles of good reasoning; the development of symbolic techniques for evaluating arguments. 4 cr.

416. PHILOSOPHICAL SURVEY OF WORLD RELIGIONS
Fundamental literature and ideas of a number of the major religious traditions of mankind. For example, archaic religions, Hinduism, Buddhism, Taoism, Judaism, Christianity, Islam. 4 cr.

417. PHILOSOPHICAL REFLECTIONS ON RELIGION
Introductory philosophy of religion. To help students become critically aware of philosophical issues involved in various forms of religious belief and some of the persisting philosophical understandings of those issues. 4 cr.

421. PHILOSOPHY AND THE ARTS
Contemporary philosophic concerns and perspectives as reflected in one or more of the arts (literature, theater, film, music, plastic art). 4 cr.

424. SCIENCE, TECHNOLOGY, AND SOCIETY
Consideration of the scientific endeavor and its social import from a philosophical perspective. 4 cr.

430. SOCIETY AND MORALS
Critical study of principles and arguments advanced in discussion of current moral and social issues. Possible topics: violence, rules of warfare, sexual morality, human rights, punishment, abortion. 4 cr.

435. THE HUMAN ANIMAL
Philosophy of biology and the evolutionary process. Readings of scientists and philosophers' commentary on scientists. Examination of the differences between scientific debate and philosophic debate. Philosophical study of scientific theory stressing humans' place in the natural world and the ethical implication of humans as natural beings in the evolutionary process. 4 cr.

475. PHILOSOPHICAL REFLECTIONS ON EDUCATION
Philosophical study of the nature, significance, and place of education within the human condition. Students begin to work out and articulate their own attitudes toward the basic issues which lie at the heart of education at all levels. 4 cr.

495. TUTORIAL READING
Basic introductory reading under faculty direction on topics of philosophical importance. Books offered for tutorial reading may be in any area the instructor chooses or on an independent study basis. Prereq: permission. Variable to 4 cr.

496. PHILOSOPHIC TOPICS
Introductory-level seminar in specific topics or problems (e.g., death, love, friendship) considered from a philosophic point of view. 4 cr.

For special introductory courses in the area of applied philosophy, see Fundamentals of Applied Philosophy, pg. 146.

520. INTRODUCTION TO EASTERN PHILOSOPHY
Major Eastern traditions of philosophy. Concentration on Indian, Chinese, and Japanese systems may vary from semester to semester. 4 cr.

530. MORAL PHILOSOPHY
Critical examination of the development of philosophical thinking regarding human values, rights, and duties. 4 cr.

550. SYMBOLIC LOGIC
Principles and techniques of modern logic, with special attention to their philosophical significance. Sentential calculus, class calculus, truth tables, and lower functional calculus; nature of deductive systems, and problems of formal consistency. Prereq: Phil 412, or equivalent and/or permission. 4 cr.

570. ANCIENT PHILOSOPHY
Development of Western philosophy from its beginnings in Greece to the Roman period, with particular emphasis on the thought of Plato and Aristotle. 4 cr.

571. MEDIEVAL PHILOSOPHY
Philosophical thought of the Middle Ages from inception in the late Roman period with thinkers such as Plotinus and Augustine through the late Medieval speculative mysticism of such figures as Meister Eckhart. Writings of Augustine and Thomas Aquinas. 4 cr.

575. MODERN PHILOSOPHY
Philosophy of the 17th and 18th centuries, including both continental rationalism and British empiricism, and emphasizing philosophers selected from among such thinkers as Hobbes, Descartes, Spinoza, Leibniz, Locke, Berkeley, and Hume. 4 cr.

577. 19th-CENTURY PHILOSOPHY
Important 19th-century philosophical movements such as later German idealism, French positivism, utilitarianism, pragmatism, Marxism, existentialism, and vitalism. Prereq: Phil 575; /or permission. 4 cr.

600. PHILOSOPHY THROUGH LITERATURE
Philosophical implications of representative literary works; content variable. 4 cr.

610. TOPICS IN AMERICAN PHILOSOPHY
Philosophical movements such as pragmatism and process philosophy. Readings from figures such as Peirce, James, Dewey, Santayana, Whitehead, and C.I. Lewis. Prereq: two courses in history of philosophy (one of which may be concurrent); /or permission. 4 cr.

615. TOPICS IN ANALYTIC PHILOSOPHY
The analytic methods applied to the solution of philosophic problems. Typical readings: Russell, Moore, Wittgenstein, Ayer, Ryle, and Austin. Prereq: two courses in history of philosophy (one of which may be concurrent); /or permission. 4 cr.

620. RECENT EUROPEAN PHILOSOPHY
Major developments and themes. Representative figures; Jaspers, Husserl, Heidegger, Bloch, Lukacs, Habermas, Bergson, Marcel, Sartre, Merleau-Ponty, Ricoeur, Kolakowski, etc. Prereq: two courses in history of philosophy (one of which may be concurrent); /or permission. 4 cr.

630. PHILOSOPHY OF THE NATURAL SCIENCES
Philosophical problems raised by the physical and biological sciences; role of mathematics in science, nature of scientific concepts of space and time, relations of science to common sense, relation of theory to observation, logic of scientific discovery, nature of historical changes in scientific world-view, relation of logic of science to the psychology and history of science. 4 cr.

146

635. PHILOSOPHY OF LAW
Systematic study of salient features of legal systems. Possible topics: nature of law; concept of legal validity; law and morality; individual liberty and the law; legal punishment; legal responsibility and related concepts (for example, legal cause, harm, *mens rea,* negligence, strict liability, legal insanity). 4 cr.

640. KANT AND HEGEL
Kant and Hegel. Prereq: two courses in history of philosophy; /or permission. 4 cr.

690. INTERDISCIPLINARY STUDIES
Interdisciplinary studies of philosophical issues arising in one or more areas of specialization outside the department. 4 cr.

699. SENIOR THESIS
Tutorial work for philosophy department candidates for "Commendation" and "Honors." Prereq: two courses in history of philosophy, senior standing, and permission. 4 cr. Cr/F.

710. PHILOSOPHY OF RELIGION
Philosophic nature and significance of religious experience; historical and systematic analysis of such traditional issues as the nature of faith, relation of faith to reason, arguments concerning the existence and nature of God, the problem of evil, the relationship of religion and morality, and the relationship of religion and science. Prereq: two courses in history of philosophy: /or permission. 4 cr.

712. ADVANCED LOGIC
A selection from: consistency and completeness of the predicate calculus; second-order logic; modal logic; axiomatic set theory; formalized arithmetic; recursive functions and Gödel's proof; Turing machines; formal semantics. Prereq: Phil 550; Math 531; /or permission. 4 cr.

715. ETHICS
Problems in ethical theory. Topics may include the utilitarian-deontologist dispute, analysis of moral language, problem of justification, and various conceptions of morality. Prereq: Phil 530; /or permission. 4 cr.

720. PHILOSOPHICAL PSYCHOLOGY
Philosophical perspectives and problems concerning human nature or the human condition; e.g., the nature of "self," human action, the body-mind problem, freedom of the will, the meaning of "person," the nature of behavior, etc. Prereq: two courses in history of philosophy; /or permission. 4 cr.

725. PHILOSOPHY OF THE SOCIAL SCIENCES
Nature of explanation and understanding in the social sciences. Similarities and differences between the social and physical sciences; claims of objectivity and of subjectivity in the social sciences; role of values in the social sciences. Prereq: two courses in history of philosophy; /or permission. 4 cr.

735. SOCIAL AND POLITICAL PHILOSOPHY
Important concepts in social and political philosophy such as natural rights, revolution, law, freedom, justice. Variable content. Prereq: two courses in history of philosophy; /or permission. 4 cr.

740. AESTHETICS
Philosophic inquiry into art and beauty. Prereq: two courses in history of philosophy; /or permission. 4 cr.

745. PHILOSOPHY OF LANGUAGE
Contemporary philosophical studies of the nature of meaning and structure of language. Prereq: two courses in history of philosophy; /or permission. 4 cr.

750. PHILOSOPHY OF HISTORY
Nature of historical knowledge, efforts to discover patterns of meaning in the past. Prereq: two courses in history of philosophy; /or permission. 4 cr.

755. METAPHYSICS
Advanced and detailed study of one or more important questions or schools of metaphysics; e.g., nature of being, nature of reality, relationship of thought and reality. Prereq: two courses in history of philosophy; /or permission. 4 cr.

760. EPISTEMOLOGY
Theory of knowledge; nature of knowledge and belief; nature of perception; theories of truth. Prereq: two courses in history of philosophy; /or permission. 4 cr.

780. SPECIAL TOPICS IN PHILOSOPHY
Advanced study of special topics; e.g., a problem, figure, or movement in the history of philosophy; or selected issues, thinkers, or developments in contemporary philosophy. Prereq: two courses in history of philosophy; /or permission. 4 cr.

795, 796. INDEPENDENT STUDY
For students who are adequately prepared to do independent, advanced philosophical work; extensive reading and writing. Before registering, student must formulate a project and secure the consent of a department member who will supervise the work. Conferences and/or written work as required by the supervisor. 1-4 cr.

Fundamentals of Applied Philosophy

The following are introductory courses on the fundamentals of philosophy in practice. Special emphasis is placed on identifying and reflecting on philosophical issues that arise in the context of one's professional as well as everyday life. They are designed to interest those who wish to examine the broader philosophical implications of their chosen professional activity and also those who share the awareness that, in today's world, a systematic value-orientation must complement one's scientific knowledge and skills.

660. LAW, MEDICINE, AND MORALS
Critical examination of the diverse legal and moral issues facing the profession of health care. Variable topics. Possible topics: duty to provide care; nature of informed consent to treatment; problems of allocating limited health care resources (e.g., withdrawal of life-support systems, quality-of-life decisions, etc.); patient's right to confidentiality; problems relating to involuntary preventive care (e.g., involuntary sterilization, psychosurgery, etc.). 4 cr.

675. COMPUTERS AND SOCIETY
Philosophical and social implications of the "Computer Revolution." Five topical parts: historical development of the computer; automata and the concept of mind and man; computers and empirical science; the automation of management; prospects for future socio-cybernetic developments. 4 cr.

683. TECHNOLOGY: PHILOSOPHICAL AND ETHICAL ISSUES
The bases of modern technology in, and its impact upon, people's philosophic conceptions of themselves and their world. Ethical, social, political, and ecological implications of technology. Risk and benefit criteria. Technological and humanistic philosophies of life. 4 cr.

Physical Education (PhEd)

CHAIRPERSON: Phyllis A. Hoff
PROFESSORS: Marion C. Beckwith, emerita; Evelyn Browne
ASSOCIATE PROFESSORS: Caroline S. Wooster, emerita; Katherine Amsden, Gavin H. Carter, Phyllis A. Hoff, Robert Kertzer, D. Allan Waterfield, Robert E. Wear, Walter E. Weiland
ASSISTANT PROFESSORS: Thomas R. Barstow, Neal F. Earls, D. Michael McKeough, B. Joyce Mills, Nancy C. Rupp
INSTRUCTOR: Darcy P. Holland
LECTURER: Frank C. Helies, Jr.
FACULTY FROM THE DEPARTMENTS OF INTERCOLLEGIATE ATHLETICS
PROFESSOR: Paul C. Sweet, emeritus
ASSISTANT PROFESSORS: Dwight E. Aultman III, Theodore W. Conner
LECTURERS: M. William Bowes, John A. Copeland, Byron H. Davis, Cecelia DeMarco, Gerald J. Friel, Richard F. Garber, Jr., Gail A. Goodspeed, Jane E. Job, Nancy L. Krueger, Carol E. R. Lowe, Russell J. McCurdy, Jean M. Rilling, James H. Urquhart

The Major Program

Prospective physical education majors should refer to pages 68–70 for information regarding the major programs.

The Elective Program

The Department of Physical Education provides an opportunity for students to participate in an elective activity program in a wide variety of sports, aquatics, conditioning, and gymnastics courses. Students may elect up to two credits of activity coursework per semester. Courses offered include: aquatics (basic swimming, advanced lifesaving, water safety instructors' course, synchronized swimming, and SCUBA), archery, badminton, bicycling, bowling, figure control, figure skating, foil fencing, golf, gymnastics, handball, hiking/orienteering, ice hockey, outdoor education, racquetball, basic skating, ski conditioning, skiing, ski touring, squash, tennis, volleyball, weight training, yoga.

The department supplies special uniforms. Students are required to furnish such items as sneakers and bathing caps. A $35 fee is charged for SCUBA; fees are also charged for off-campus activities such as skiing. Students with physical limitations are encouraged to participate in the program on a modified basis. Students may repeat the same level activity for credit with the instructor's approval.

Elective Physical Education

410-455. ELECTIVE PHYSICAL EDUCATION
Activity coursework open to all undergraduates. Cr/F.

Half-Semester Courses (.5 credits each)

410. ARCHERY
411. FIGURE SKATING—BEGINNING
412. FIGURE SKATING—ELEMENTARY/INTERMEDIATE
413. BICYCLING
414. BASIC SKATING
415. GOLF—BEGINNING
416. GOLF—INTERMEDIATE
417. ICE HOCKEY
418. SKI CONDITIONING
419. SKIING—BEGINNING*
420. SKIING—BEGINNING†
421. SKIING—INTERMEDIATE†
422. SKIING—ADVANCED†
423. SKIING—RACING†
424. SKI TOURING—BEGINNING
425. TENNIS—BEGINNING
426. TENNIS—ELEMENTARY
427. TENNIS—INTERMEDIATE
428. TENNIS—ADVANCED
429. SPECIAL TOPIC
430. SPECIAL TOPIC
431. SQUASH
432. SKI TOURING—INTERMEDIATE
433. RACQUETBALL—BEGINNING
434. RACQUETBALL—INTERMEDIATE
436. BOWLING
443. OUTDOOR EDUCATION

*On campus
†Gunstock

Full-Semester Courses (1 credit each)

435. BADMINTON
437. COURT GAMES (HANDBALL, RACQUETBALL, SQUASH)
438. FENCING—BEGINNING
439. FENCING—INTERMEDIATE
440. FIGURE CONTROL
441. GYMNASTICS
442. HIKING/ORIENTEERING
447. ADVANCED LIFESAVING
448. SWIMMING—BASIC
449. SYNCHRONIZED SWIMMING
451. VOLLEYBALL
452. WEIGHT TRAINING AND CONDITIONING
453. YOGA
454. SPECIAL TOPIC
455. SPECIAL TOPIC

Specialized Physical Education Coursework for Majors

470-491. MAJOR ACTIVITY COURSEWORK
Performance skills and beginning teaching methods.

470. GYMNASTICS 1 cr.
471. OUTDOOR EDUCATION 1 cr. Cr/F.
472. EDUCATIONAL GYMNASTICS
1 cr. Gymnastics in movement education emphasizing the problem-solving method of teaching.
473. TRACK & FIELD 1 cr.
474. FOLK, SQUARE, & SOCIAL DANCE .5 cr.
475. CONDITIONING .5 cr.
476. VOLLEYBALL .5 cr.
477. TENNIS .5 cr.
478. LEAD-UP GAMES .5 cr.
479. ACTIVITIES FOR ELEMENTARY SCHOOL .5 cr.
480. WRESTLING .5 cr.
481. MEN'S SOCCER .5 cr.
482. MEN'S LACROSSE .5 cr
483. BASEBALL .5 cr.
484. SOFTBALL .5 cr.
485. MEN'S BASKETBALL .5 cr.
486. WOMEN'S LACROSSE .5 cr.
487. FIELD HOCKEY .5cr.
488. FUNDAMENTALS OF MODERN DANCE .5 cr.
489. WOMEN'S SOCCER .5 cr.
491. WOMEN'S BASKETBALL .5 cr.

148

Theory Courses—Physical Education

500. PERSPECTIVES IN PHYSICAL EDUCATION
An introduction to the profession of physical education, including concentrations on the historical, sociological, and adapted perspectives. 4 cr.

501. ADVANCED FIRST AID AND EMERGENCY CARE
American National Red Cross Program in advanced first aid and emergency care. 2 cr. Cr /F.

502. BASIC ATHLETIC TRAINING
Etiology, pathology, acute care, and prognosis of sports injuries. Lab. 4 cr.

520. WATER SAFETY INSTRUCTORS' COURSE
Analysis of aquatic techniques; methods of teaching swimming, diving, and lifesaving. A.R.C. instructor authorization awarded to candidates with high caliber of personal skill, knowledge, and teaching ability. Prereq: current advanced lifesaving certification. 2 cr.

521. THEORY OF COACHING BASKETBALL
Individual and team offense and defense; rules of the game. Problems in team handling and conditioning. Prereq: PhEd 485 or 491. 2 cr.

522. THEORY OF COACHING FOOTBALL
Systems of play; team and individual offensive and defensive fundamentals; theory and strategy of team play; coaching methods, physical conditioning; rules. 2 cr.

523. THEORY OF COACHING HOCKEY
Basic hockey skills. Fundamentals of individual and team offense and defense; coaching methods; rules. 2 cr.

524. THEORY OF COACHING BASEBALL
Batting and fielding; fundamentals of each position; problems of team play; coaching methods; physical conditioning; rules. Prereq: PhEd 483 or 484. 2 cr.

525. THEORY OF COACHING SOCCER
Fundamental and advanced skills and techniques; offensive and defensive principles of team play; tactical formations and strategy; methods of training and practicing; rules. Prereq: permission. 2 cr.

526. THEORY OF COACHING WRESTLING
Theory, practical teaching methods, and the development of skills and techniques from basic maneuvers to the more advanced. Prereq: PhEd 480. 2 cr.

527. AQUATIC LEADERSHIP TRAINING
Methods, organization, and administration of A.R.C. and YMCA aquatic programs. Methods of teaching swimming, diving, and lifesaving; program planning; officiating; operation and maintenance of swimming pools; camp waterfront; health and safety aspects of aquatic programs; legal problems; skin and SCUBA diving; drownproofing. Prereq: current advanced lifesaving certificate. 2 cr.

528. THEORY OF COACHING TRACK AND FIELD
Starting, sprinting, middle-distance and distance running, relay, hurdling, high and broad jumping, pole vault, shot putting, discus, hammer, and javelin. Methods of training and practicing. Prereq: PhEd 473. 2 cr.

529. THEORY OF COACHING GYMNASTICS
Theory, practical teaching methods, and officiating. Construction of gymnastic routines, from elementary to international level. Prereq: PhEd 470. 2 cr.

530. THEORY OF COACHING SWIMMING AND DIVING
Philosophy, historical development, and psychological theories of coaching. Mechanical and kinesiological aspects of the competitive strokes and required optional dives, low and high board. Prereq: PhEd 447. 2 cr.

531. THEORY OF COACHING FIELD HOCKEY
Analysis of field hockey coaching techniques. New systems of play; use of interval training for preseason conditioning and inseason practices. Prereq: PhEd 487 or permission. 2 cr.

532. THEORY OF COACHING RACQUET SPORTS
Thorough and indepth knowledge of the administration and coaching of major racquet sports: badminton, racquetball, squash, and tennis. Prereq: permission. 2 cr.

533. BASIC SCUBA
Pool and classroom instruction in SCUBA fundamentals, N.A.U.I. certification for successful completion of course and 3 open water dives. Strong swimming ability required. $35 fee. 2 cr.

534. ADVANCED SCUBA
Pool, classroom, and open ocean experience in diving techniques and equipment used by underwater researchers. Prereq: basic certification and permission. $35 fee. 2 cr.

563. THE THEORY OF TEACHING PHYSICAL EDUCATION IN THE SECONDARY SCHOOL
Teaching methods. Lab. Prereq: minimum of 6 credits from coursework numbered PhEd 470-491; Educ 500. 4 cr.

606. NEUROLOGY
Morphology, physiology, and histology of the human nervous system. Designed primarily for students in occupational therapy. Lab. Prereq: Zool 507-508. 4 cr.

610. ADAPTED PHYSICAL EDUCATION
Common disorders of handicapped children; practical experience in the remediation of those disorders through the use of adapted physical education activities. Lab. Prereq: Zool 507-508. 4 cr.

620. PHYSIOLOGY OF EXERCISE
Acute and chronic effects of exercise. Muscle physiology, respiration, cardiac function, circulation, energy metabolism, and application to training. Prereq: Zool 507-508. 4 cr.

621. EXERCISE LABORATORY TECHNIQUES
Administration of graded exercise tests on treadmill, bicycle ergometer, and stepping bench. Monitoring physiological variables during the graded exercise test. Calculation of metabolic data resulting from the exercise test. Prereq: PhEd 620. 3 cr.

622. THERAPEUTIC EXERCISE AND EXERCISE PRESCRIPTION
Use of exercise test results to design, prescribe, and conduct exercise programs, primarily for adults. Lab. Prereq: PhEd 620. 3 cr.

625. DYNAMICS OF HUMAN MOVEMENT
Kinesiological consideration of factors which affect efficiency. Cinematographic and noncinematographic forms of analysis of selected movement events and sequences. Prereq: Zool 507-508. (Not open to students who have taken PhEd 652). Lab. 4 cr.

630. EVOLUTION OF SPORT
Sports as an institution in selected geographical areas of the world. Relationship to war, art, and religion; ritualistic role; historic use by nations. Primarily for nonmajors. Prereq: permission. 4 cr.

633. SOCIAL FOUNDATIONS OF SPORT AND PHYSICAL ACTIVITY
Interdependence of human movement experiences, as exemplified in sport, play, and games, and various cultural, subcultural, and social factors. Prereq: Soc 400. 4 cr.

635. SPORT IN LITERATURE
Survey of sport as it is recorded in literature, both classical and contemporary, and the effect of sport on writing. 4 cr.

637. SPORT—AN ETHOLOGICAL APPROACH
Survey of ethology (animal behavior). Ethological principles applied to the development and conduct of sports and to other disciplines such as psychology, sociology. Prereq: Soc 411, or permission. 4 cr.

650. EXERCISE SPECIALIST INTERNSHIP
A one-semester internship in an agency that offers physical activity programs of prevention, intervention, and rehabilitation. Activities include graded exercise testing, exercise prescription, and exercise session leadership. Prereq: Open only to students who are enrolled in the Exercise Specialist Option and have completed all requirements for the option. 8 cr.

652. KINESIOLOGY
The science of human motion. Human muscular anatomy; actions of skeletal muscles using electromyographic evidence. Applications of concepts of muscle physiology and biomechanics to physical education activities. Lab. Prereq: Zool 507-508. (Not open to students who have taken PhEd 625.) 4 cr.

668. MEASUREMENT PROCEDURES IN PHYSICAL EDUCATION
Essential elementary statistical methods; measurement data scientifically evaluated for application to the program. Lab. 4 cr.

675. MOTOR DEVELOPMENT OF THE YOUNG CHILD
Characteristics of motor behavior across time, and the role of movement in a child's total development. Growth processes, analysis of movement, variations in movement due to maturation, environment, and experiences. Prereq: PhEd 472 or permission. Lab. 4 cr.

692. THEORIES OF TEACHING PHYSICAL EDUCATION IN THE ELEMENTARY SCHOOL
Current theories and methods; consideration given to growth and developmental needs in curriculum planning. Prereq: 6 credits from PhEd 470-491; Educ 500; PhEd 675. Lab. 4 cr.

696. INDEPENDENT STUDY
In-depth study. Prereq: PhEd majors with junior standing and approval of academic adviser and department chairperson. 2-4 cr.

702. ADVANCED ATHLETIC TRAINING
Assessment, rehabilitative treatment, preventive strapping, and protective equipment used in athletic training. Administration of a training room facility. Lab. Prereq: PhEd 502. 4 cr.

703. LABORATORY PRACTICE IN ATHLETIC TRAINING
150 hours of experience in UNH athletic training room under N.A.T.A. certified trainer. Prereq: PhEd 502. May be repeated up to 8 cr. 2 cr.

720. INTERPRETATION AND ASSESSMENT OF PHYSICAL FITNESS
Planning and implementation of programs of conditioning and fitness in the general program of education in the school. Personal fitness; components of physical fitness and conditioning; current tests; rehabilitation of individuals of all ages, particularly in college and adult programs. Prereq: PhEd 620 or equivalent. 4 cr.

730. CURRICULUM PLANNING IN PHYSICAL EDUCATION
Criteria and factors involved in planning and construction of school programs. 4 cr.

731. CONDITIONING FOR MAXIMUM PERFORMANCE
Anatomical and physiological factors related to maximum physical performance. Evaluation of present programs of training. Prereq: PhEd 620 or equivalent. 4 cr.

740. PERCEPTUAL MOTOR DYSFUNCTION
Theoretical rationale and clinical perceptual-motor training programs of Ayres, Kephart, Cratty, Barsch, and Getman, as they relate to sensory-motor integration and the remediation of learning disabilities. Prereq: PhEd 775, or permission. 4 cr.

750. ANALYZING TEACHING IN PHYSICAL EDUCATION
Examination of teaching practices, theories, and research implications. Varied approaches to the study and improvement of teaching, including analysis of films and tapes. Prereq: PhEd 563 or 692 or permission. 4 cr.

775. PERCEPTUAL MOTOR LEARNING
Variables affecting the learning and performance of skilled activity; ability and motivational characteristics of the learner; processes for skill acquisition. Prereq: Psyc 401. Lab. 4 cr.

780. PSYCHOLOGICAL FACTORS IN SPORT
Factors of outstanding athletic achievement; psychological variables in competition; the actions and interactions of sport, spectator, and athlete. Prereq: Psych 401 or PhEd 775. 4 cr.

791. HISTORY OF PHYSICAL EDUCATION
From ancient Egypt to modern times. Influences of Greece, Rome, the Renaissance and Reformation periods, and modern European nationalism. Analysis of events and the beliefs of leaders in the development of systems of physical education. 4 cr.

Physics (Phys)

CHAIRPERSON: Robert E. Houston, Jr.
PROFESSORS: Harry H. Hall, emeritus; Roger L. Arnoldy, L. Christian Balling, Edward L. Chupp, Robert E. Houston, Jr., Richard L. Kaufmann, Robert H. Lambert, John A. Lockwood, Lyman Mower, John E. Mulhern, Jr., Harvey K. Shepard, William R. Webber
ASSOCIATE PROFESSORS: John F. Dawson, Lennard A. Fisk, Jr., Barry J. Harrington, Jochen Heisenberg, Robert E. Simpson, John J. Wright
LECTURER: L. William Dotchin

401-402. INTRODUCTION TO PHYSICS I AND II
Broad survey of classical and modern physics. Designed to enable students to appreciate the role of physics in today's society and technology. Emphasis on the fundamental laws of nature on which all science is based. Knowledge of high school algebra and trigonometric functions essential. Lab. 4 cr.

403-404. INTRODUCTORY PHYSICS FOR BIOLOGISTS
Physical principles of mechanics, thermodynamics, acoustics, optics, electricity, and modern physics, illustrated where possible with examples of interest to biologists. Knowledge of high school algebra and trigonometric functions essential. Lab. 4 cr.

150

405. CONCEPTS OF PHYSICS
Descriptive course investigating a limited number of important physical systems. Emphasis on how the system is to be investigated and the patterns in which the results fall. Intuitive concepts used in investigations traced into their application in modern physics. Patterns of thought in physics related to patterns of thought in liberal arts. Recommended for liberal arts juniors and seniors. 4 cr.

406. INTRODUCTION TO MODERN ASTRONOMY
Descriptive coverage of contemporary astronomical and astrophysical techniques with a review of current knowledge and theories concerning the solar system, galaxies, and the universe. Recommended for liberal arts and beginning science students. Lab. 4 cr.

407-408. GENERAL PHYSICS I AND II
Introductory course emphasizing mechanics and electromagnetism. Recommended for the student specializing in science and engineering. Prereq: thorough knowledge of algebra and trigonometry; Math 425 for 407, and Math 426 for 408, or taken concurrently. Lab. 4 cr.

411. HOUSEHOLD PHYSICS
Practical, nonmathematical introduction to the physical principles necessary to understand how and why common devices work. Emphasis on household appliances and automobile. Classroom demonstrations and laboratories to illustrate theories and practical applications. Prereq: permission. Students may receive credit for either 411 or 412, but not both. 4 cr.

412. TECHNICAL PHYSICS
An introductory course in physics emphasizing the fundamentals of mechanics, heat, electricity, and other subjects underlying modern machinery and instruments. Recommended for Thompson School students. Prereq: algebra, trigonometry; permission. Students may receive credit for either 411 or 412, but not both. Lab. 4 cr.

505. GENERAL PHYSICS III
Fluid dynamics, thermodynamics, kinetic theory, optics, wave motion, introduction to modern physics. Prereq: Phys 408; Math 425, 426. Lab. 4 cr.

516. PHYSICAL MECHANICS
Analytical treatment of classical mechanics covering dynamics of particles and rigid bodies. Newton's laws, conservation theorems, oscillations, central force problem, generalized coordinates, and Lagrange's equations. Prereq: Phys 505 or equivalent; Math 528 passed or taken concurrently. 4 cr.

602. THERMAL PHYSICS
Classical and statistical approach to thermodynamics, kinetic theory. Prereq: Phys 505; Phys 516 or equivalent; Math 528. 4 cr.

605-606. EXPERIMENTAL PHYSICS I AND II
Circuit design with passive and active elements, electrical measurements for experimental physics, digital electronics and interfacing techniques. Prereq: Phys 505; Math 527 passed or taken concurrently. Lab. 4 cr.

607. OPTICS
Geometrical optics, electromagnetic theory of light, interference, diffraction, polarization, related phenomena and nonlinear optics. Prereq: Math 528. Lab. 4 cr. (Offered if sufficient demand.)

613, 614. SPECIAL TOPICS I AND II
Any selected topics not covered sufficiently in a general course may be studied. 4 cr.

618. INTRODUCTION TO SOLID STATE PHYSICS
Theory underlying the behavior of solids. Transport theory and the interaction of radiation and matter. Operation of semiconducting and superconducting devices and lasers. Prereq: Math 527 or equivalent. 4 cr. (Offered if sufficient demand.)

695, 696. INDEPENDENT STUDY
Individual project under direction of a faculty adviser. Prereq: departmental permission. 1-8 cr.

701-702. INTRODUCTION TO QUANTUM MECHANICS I AND II
Modern physics, nonrelativistic Schroedinger equation, the hydrogen atom, applications to atomic and molecular structure. Prereq: Math 527; Math 528; /or permission. Math 646 desirable. 4 cr.

703-704. ELECTRICITY AND MAGNETISM I AND II
Foundation of electromagnetic theory; electrostatics, dielectric theory, electromagnetism, magnetic properties of matter, alternating currents, Maxwell's field theory. Prereq: Math 527; Math 528; /or permission. Math 646 or 745 desirable. 4 cr.

705-706. EXPERIMENTAL PHYSICS III AND IV
Modern physics experiments and special project problems assigned to individual students. Prereq: senior standing in physics. Lab. 4 cr.

710. INTRODUCTION TO MODERN COSMOLOGY
Review of the sun, stars, Milky Way, external galaxies, and expansion of the universe. Recent discoveries of radio galaxies, quasi-stellar objects, cosmic black-body radiation, X rays, and gamma rays precede a discussion of Newtonian and general relativistic cosmological models, steady-state/big-bang theories, and matter-antimatter models. Prereq: Phys 406; Phys 516; Math 527; /or permission. 4 cr.

Plant Science (PlSc)

CHAIRPERSON: Owen M. Rogers
PROFESSORS: Russell Eggert, emeritus; Clarence A. Langer, emeritus; Ford S. Prince, emeritus; Gerald M. Dunn, Lincoln C. Peirce, Owen M. Rogers, Douglas G. Routley
ASSOCIATE PROFESSORS: Henry A. Davis, emeritus; George O. Estes, Yun Tzu Kiang, David W. Koch, J. Brent Loy, James R. Mitchell, James E. Pollard, Jerry A. Warren, Otho S. Wells
ASSISTANT PROFESSOR: John M. Roberts
ADJUNCT ASSISTANT PROFESSOR: Merrill C. Hoyle

421. CONCEPTS OF PLANT GROWTH
Fundamentals underlying plant growth and response in natural and modified environments. Lab. 4 cr.

427. LANDSCAPING THE HOME GROUNDS
Design and maintenance of small properties; arrangement, plant use for the beautification of home surroundings. Lab. 4 cr.

522. ENVIRONMENT AND PLANT RESPONSE
Plant response to environmental factors; nature and control of environmental stresses; plants in the conservation and efficient use of environmental resources. Prereq: PlSc 421 or Bot 411 or permission. Lab. 4 cr.

535. HISTORY AND USE OF CULTIVATED PLANTS
Importance of cultivated plants in various civilizations. Use of plant or plant-derived products in early and contemporary societies. Lab. 4 cr.

566. TURF MANAGEMENT
Adaptation and management of fine turf grasses for recreational, aesthetic, and functional use. 3 cr.

604. PRINCIPLES OF GENETICS
Chemical and physical bases of inheritance; genes and chromosomes as units of mutation; genes in populations. Prereq: Basic laboratory course in biological sciences. Organic chemistry; college math or statistics suggested. (Equivalent to Zool 604.) 4 cr.

606. PLANT PHYSIOLOGY
Structure and function in higher plants; water relations, metabolism, and growth and development. Prereq: Bot 411 or 503 or PlSc 421; one year of chemistry; /or permission. Lab. (Equivalent to Bot 606.) 4 cr.

607. WEED SCIENCE
Biology and identification of common weeds; weeds in relation to humans; harmful effects of weeds; cultural, biological, and chemical control of weeds; properties and functions of herbicides; herbicides and the environment. Prereq: PlSc 421. Lab. 4 cr. (Not offered every year.)

651. FRUIT CROPS
Tree fruits and small fruits of the temperate zone: culture, management, and marketing for the small enterprise. Lab. 4 cr.

652. VEGETABLE CROPS
A discussion of technology and systems for producing and marketing vegetables locally and nationally, and a study of characteristics of specific crops and of their response to environment. Prereq: PlSc 421 and 522 or equivalent. 4 cr.

653. FORAGE CROPS
Selection, establishment, and management of crops grown for livestock utilization; field-oriented lab. Prereq: PlSc 421, Bot 411, or permission. Lab. 4 cr.

654. CEREAL CROPS
Management practices related to the production and utilization of the world's major grain crops. Prereq: PlSc 421, Bot 411, or permission. 3 cr. (Not offered every year.)

672. PLANT PROPAGATION AND MAINTENANCE
Sexual and asexual propagation of horticultural plants. Plant science majors only. Lab. 4 cr.

678. ORNAMENTAL PLANTS
Their identification, culture, and use. Prereq: Bot 566 or equivalent. Lab. 4 cr.

705. POPULATION GENETICS
Population growth and regulation; distribution of genes; factors affecting gene frequency; genetic load; natural selection; ecological genetics. Prereq: Zool or PlSc 604; INER 528; /or permission. 4 cr. (Not offered every year.)

708. PLANT NUTRITION
Nutritional aspects of higher plants; uptake, translocation, and metabolic role. Prereq: plant physiology; soils. Lab. 4 cr. (Not offered every year.)

720. LABORATORY TECHNIQUES IN PLANT SCIENCES
Use of laboratory instruments and techniques including extraction procedures, spectrophotometry, fluorometry, electrophoresis, chromatography, atomic absorption spectrophotometer, measurement of respiration and photosynthesis, photography, use of microscopes, and use of instruments for monitoring the environment. Prereq: chemistry (three semesters) or permission. 2 cr.

740. EVOLUTIONARY BIOLOGY
Synthetic theory of evolution in origin of life, species, and higher groups; sources of genetic variability; population structure; causes of evolution; evolution of communities; molecular evolution and rates of evolution. Prereq: Zool or PlSc 604; /or permission. PlSc or Genetics 705 suggested. 4 cr. (Not offered every year.)

762. PLANT METABOLISM
Function, occurrence, synthesis and degradation of plant consituents; respiration and photosynthesis; metabolism of nitrogenous and aromatic compounds; biochemical mechanisms in seed dormancy, fruit ripening, and disease resistance. Prereq: Bchm 601 or 751. 2 or 4 cr. (Not offered every year.)

773. METHODS AND THEORY OF PLANT BREEDING
Plant breeding systems for qualitative and quantitative plant improvement. Prereq: PlSc or Zool 604; INER 528; /or permission. 3 cr. (Not offered every year.)

776. RADIOISOTOPE TECHNIQUES FOR LIFE SCIENCES
Application of radioisotopes to biological systems; detection and measurement, liquid scintillation spectrometry and autoradiography, gamma-ray spectrometry, radiochromatogram scanning, and tissue distribution of radioisotopes. Prereq: inorganic chemistry; physics. Lab. 4 cr.

795, 796. ADVANCED TOPICS IN PLANT SCIENCE
Independent research, study, or group discussion. A) Physiology; B) Genetics; C) Plant Utilization. Staff. Prereq: permission. 2 or 4 cr.

Political Science (Polt)

CHAIRPERSON: David L. Larson
PROFESSORS: John T. Holden, emeritus; Robert B. Dishman, Bernard K. Gordon, George K. Romoser, Allan Spitz
ASSOCIATE PROFESSORS: Frederic W. Wurzburg, emeritus; Warren Brown, John R. Kayser, David L. Larson, David W. Moore, Lawrence W. O'Connell, B. Thomas Trout, Susan O. White
ASSISTANT PROFESSORS; Robert E. Craig, Joseph P. Ford, George K. Lagassa

Introductory Courses and Independent Study

400. CONTEMPORARY POLITICS
Examination of varying domestic and international political issues, such as censorship, electoral reform, terrorism, and international security, corruption, and environmental pollution. See departmental listings for semester offerings. 4 cr.

401. POLITICS AND SOCIETY
Introduction to nature of politics and political institutions. Emphasis on political behavior and continuing issues of modern politics, such as power, authority, legitimacy, freedom and order. 4 cr.

402. AMERICAN GOVERNMENT AND POLITICS
Institutions and processes of national government in the United States, and political culture of the American people. Structure of national government; role of general public in government; cultural influences on American politics. 4 cr.

403. THE UNITED STATES IN WORLD AFFAIRS
Major issues in world affairs since 1945 as they relate to United States foreign policy. U.S.-Soviet relations, third-world politics, regional and alliance politics, weapons technology and resource depletion, problems of economic development and population control. 4 cr.

595, 596. EXPLORATIONS IN POLITICS
Designed to meet special interests of students and instructors in exploring selected issues in political science. 2-4 cr.

152

795, 796. INDEPENDENT STUDY
For juniors and senior with at least 3.0 cumulative G.P.A. Specialized programs of study. Application guidelines in department office. Prereq: permission. 4 cr.

American Politics

500. AMERICAN PUBLIC POLICY
Political and economic factors which mold the processes by which American policymakers deal with such domestic issues as crime and violence, poverty and inequality, inflation and unemployment, urban blight and renewal, and energy and the environment. 4 cr.

502. STATE GOVERNMENT AND FEDERALISM
Powers, politics, and constitutional setting of American state governments. State legislature, governorships, party systems, and interest groups. Problems of taxation, welfare, environment, and education. 4 cr.

503. LOCAL GOVERNMENT AND POLITICS
Structure, politics, and legal setting of American local government, including towns, cities, counties, and special districts. Community power and decision making, town meetings and such issues as home rule, zoning, and the property tax. 4 cr.

504. AMERICAN PRESIDENCY
Role and powers of the presidency in domestic and foreign affairs. The president as administrator, policymaker, and political leader. Executive-congressional relations. 4 cr.

505. AMERICAN CONGRESS
Role and powers of Congress as national lawmaker and check on the executive branch. Committee structure, concepts of representation, legislative oversight, and party cleavage. Problems of federal budget control and foreign policy involvement. 4 cr.

506. PARTIES, INTEREST GROUPS, AND VOTERS
The role of political parties as organizers and managers of social conflict. The role of voters in controlling parties and government. The influence of interest groups in the electoral process and in governmental decision making. 4 cr.

507. THE POLITICS OF CRIME AND JUSTICE
Criminal justice in theory and practice: contemporary role of police, prosecutors, judges, juries, counsel, and interest groups in the administration of criminal justice. 4 cr.

508. SUPREME COURT AND THE CONSTITUTION
Supreme Court treated as a political institution whose historic mission is to decide all controversies arising under the Constitution between the nation and the states, the President and Congress, the governments, generally, and the people as to their respective rights and duties. 4 cr.

509. BUREAUCRACY IN AMERICA
Growth and development of the bureaucratic state. Roles and powers of administrative officials, decision making in bureaucratic settings, citizen participation, and the influence of interest groups on bureaucratic policy making. 4 cr.

510. THE MASS MEDIA IN AMERICAN POLITICS
Contemporary review of media in politics; major roles of media today in providing news, setting public agenda, influencing public; government regulation vs. media responsibility; future developments and consequences for American democracy. 4 cr.

511. MARINE POLICY
The legal and policy aspects of coastal zone, continental shelf, and ocean resource management including fish, oil, gas, pollution, offshore installations, and the deep seabed. 4 cr.

512. PUBLIC OPINION IN AMERICAN POLITICS
The relationship of mass and elite opinion within the context of American political culture. The impact of public opinion on American governmental policies, especially with respect to major issues facing the President and Congress. Appraisal of responsiveness to influence and responsibility to lead. 4 cr.

513. CIVIL RIGHTS AND LIBERTIES
Analysis of three major areas of Constitutional rights and liberties—political freedom, equal protection of the laws, and due process—with particular attention to their impact on such problems as political protest, discrimination, school segregation and busing, and student rights. 4 cr.

600. SELECTED TOPICS IN AMERICAN POLITICS
Special topics such as politics and public affairs in New Hampshire, the press and the media in America, women in politics, and civil liberties. See department listings for semester offerings. 4 cr.

601. ELECTION PRACTICUM
Field work in political campaigns combined with analysis of the electoral process. Prereq: permission. 4 cr. (Not offered every year.)

602. INTERNSHIP IN AMERICAN GOVERNMENT
Practical work experience in a federal, state, local, or regional government office will be integrated with assigned readings and a student research project. Prereq: permission. May be repeated for a total of 8 cr. 4 cr.

701. THE COURTS AND PUBLIC POLICY
Impact of judicial decisions on public policy at federal, state, local, and regional levels. 4 cr.

702. PUBLIC PLANNING AND BUDGETING
Analysis, goal setting, and strategic planning in a governmental setting, with particular emphasis on budgetary processes as a means for controlling policy effectiveness. 4 cr.

703. URBAN AND METROPOLITAN POLITICS
Planning and management of the urban community, intergovernment relations, administrative functions, and general urban problems. 4 cr.

797, 798. SECTION B: SEMINAR IN AMERICAN POLITICS
Advanced analysis and individual research. Prereq: senior or graduate standing. 4 cr.

797, 798. SECTION F: SEMINAR IN PUBLIC ADMINISTRATION
Advanced analysis and individual research, including opportunities for direct observation of governmental administration. Prereq: senior or graduate standing. 4 cr.

Comparative Politics

544. DICTATORSHIP AND TOTALITARIANISM
Political systems of Nazi Germany, Fascist Italy, Stalinist Russia, and Maoist China; the movements which gave rise to them and their significance for understanding political behavior. 4 cr.

552. CONTEMPORARY EUROPEAN POLITICS
Politics and governments in Western Europe, with attention both to basic characteristics of political life in different countries and current issues of politics. 4 cr.

553. DEVELOPING NATIONS
Politics in selected developing states in Africa, Latin America, Asia, and the Middle East. Issues and concepts of political change. 4 cr.

555. POLITICS IN THE USSR
Background, structure, leadership, and underlying issues of the Soviet political system. Ideological bases, political history, and contemporary trends. 4 cr.

556. POLITICS IN CHINA
Historical development, structure, ideological bases, and underlying contemporary issues of the Chinese political system; influence of ideology and the role of Maoism. 4 cr.

557. POLITICS IN JAPAN AND SOUTHEAST ASIA
Major noncommunist governments in East Asia; parties and policy-making in Japan and other states such as Malaysia, Thailand, Indonesia, and the Phillippines. 4 cr.

651. SELECTED TOPICS IN COMPARATIVE POLITICS
Specialized areas or issues such as territory in politics, politics of Germany, judicial systems, administrative law, etc. See department listing for semester offerings. 4 cr.

741. POLITICS OF INDUSTRIALIZED STATES
Impact of modern industrialism and its organization upon political life and the conduct of government. 4 cr.

742. COMMUNIST SYSTEMS
Interests, demands, and decision making in communist governments. Ideological issues, political behavior within communist international organizations, intraparty relations, distinctions between ruling and nonruling communist parties. 4 cr.

797, 798. SECTION C: SEMINAR IN COMPARATIVE POLITICS
Advanced analysis and individual research on foreign nations or regions, focusing on governmental institutions, foreign policy, political parties, or bureaucracy. Prereq: senior or graduate standing. 4 cr.

International Politics

560. WORLD POLITICS
Issues and structures which shape contemporary international politics, including rise of the nation-state system, conflict and its resolution, and problems of national interest and choice between nations. 4 cr.

561. AMERICAN FOREIGN POLICY
The institutional, political, and societal factors that shape the formulation and execution of U.S. foreign policy. 4 cr.

562. STRATEGY AND NATIONAL SECURITY POLICY
Defense and deterrence among the major powers, including the impact of modern weapons on war and arms limitations, the military as a profession and the role of the armed forces in shaping defense policy. 4 cr.

563. FOREIGN POLICIES OF EUROPE
East-West relations, security alliances, economics and political cooperation, and impact of domestic changes and superpower relationships upon the international politics of Europe. 4 cr.

564. SOVIET FOREIGN POLICY
Background and contemporary perspectives of the Soviet role in international politics. Particular emphasis on issues in international communism, Soviet-American relations, Soviet arms development, and Sino-Soviet relations. 4 cr.

565. FOREIGN POLICIES OF ASIA AND THE PACIFIC
Current foreign and defense policies as they affect the Pacific region. International politics of China, Japan, and selected Southeast Asian nations, including their efforts at cooperation. 4 cr.

660. SELECTED TOPICS IN INTERNATIONAL POLITICS
Specialized areas or issues in international relations such as conflict resolution and disarmament, European perspectives on American politics, contemporary diplomatic practices, seapower and defense, etc. See department listings for semester offerings. 4 cr.

760. THEORIES OF INTERNATIONAL POLITICS AND INTEGRATION
General explanations of the behavior of nations; theory and practice of super-national integration; theories of peace and security and community building at the international level; concepts and experience in arms limitations and conflict resolution. 4 cr.

761. INTERNATIONAL LAW
Formalized processes for regularizing state behavior; development of norms based on custom, precedent, and formal institutions, as in treaties and cases. Arms reduction and limitation arrangements; inspection, and other formal procedures designed to preserve peace. 4 cr.

778. INTERNATIONAL ORGANIZATION
Collective security and other forms of cooperation among nations through international organizations such as the United Nations and its predecessors, and through regional bodies. 4 cr.

797, 798. SECTION E: SEMINAR IN INTERNATIONAL POLITICS
Advanced analysis and individual research; emphasis on developments in theory. Prereq: senior or graduate standing. 4 cr.

Political Thought

520. JUSTICE AND THE POLITICAL COMMUNITY
Origin of the idea of justice, relationship between politics, justice, and morality; selections from Plato, Aristotle, and Roman, Islamic, and Christian political philosophers. 4 cr.

521. RIGHTS AND THE POLITICAL COMMUNITY
Human rights and the quality of communities as expressed in Hobbes, Locke, Mandeville, Rousseau, and others. 4 cr.

522. DISSENT AND THE POLITICAL COMMUNITY
Current political ideologies and controversies in America and abroad; liberal democracy and its critics since the 19th century. 4 cr.

523. AMERICAN POLITICAL THOUGHT
American political thinkers and observers of American politics; the founding of the Republic; problems and tensions reflected in the writings of Calhoun, Thoreau, Lincoln, de Tocqueville, and others; relations between liberty and authority, democracy and stability, capitalism and alienation. 4 cr.

524. POLITICS AND LITERATURE
Classical and contemporary works of literature to illustrate perennial issues in political philosophy; among authors studied are Aristophanes, Sophocles, Shakespeare, Melville, Tolstoy, and Sartre. 4 cr.

620. SELECTED TOPICS IN POLITICAL THOUGHT
Selected issues in political theory, such as liberalism and conservatism, radical political thought, the American political character, and others. See department listings for semester offerings. 4 cr.

720. PERSPECTIVES ON POLITICAL SCIENCE
Different views on the study and meaning of politics. Perspectives of political scientists, political philosophers, and political activists. 4 cr.

721. ECONOMIC THOUGHT AND POLITICS
Economic theories from the perspective of political thought. Economic activity and resource distribution in relation to historical and contemporary issues such as freedom, equality, authority, community, democracy, and quality of life. 4 cr.

797, 798. SECTION I: SEMINAR IN POLITICAL THOUGHT
Advanced treatment and individual research. Prereq: senior or graduate standing. 4 cr.

Portuguese

(See Ancient and Modern Languages and Literatures: Spanish)

Psychology (Psyc)

CHAIRPERSON: Ronald E. Shor
PROFESSORS: Herbert A. Carroll, emeritus; George M. Haslerud, emeritus; Robert I. Watson, emeritus; Raymond L. Erickson, Gordon A. Haaland, John A. Nevin, Ronald E. Shor
ASSOCIATE PROFESSORS: Lance K. Canon, James R. Davis, Peter S. Fernald, Earl C. Hagstrom, John E. Limber, Daniel C. Williams
ADJUNCT ASSOCIATE PROFESSOR: Robert G. Congdon
ASSISTANT PROFESSORS: William M. Baum, Ellen S. Cohn, Kenneth Fuld, R. Michael Latta, David E. Leary, Carolyn J. Mebert, William R. Woodward
LECTURERS: Stephen Seeman, Robert Smith, Sarah Stram, David Sugarman, Dan Swift

The listings below are general descriptions of the courses. Students are referred to the Instructors' Course Descriptions published by the department each semester for specific details about each section. Listings will be made available in departmental offices before and during the preregistration period. All courses are offered each year unless otherwise noted. Most general courses and all basic major courses are offered every semester.

General Courses

401. INTRODUCTION TO PSYCHOLOGY
Psychology as a behavioral science; its theoretical and applied aspects. Coverage of basic topics in the field, including developmental, learning, personality, abnormal, social, perceptual/sensory, and physiological psychology. To actively experience the nature of psychological research, students have an opportunity to participate in a variety of studies as part of a laboratory experience. 4 cr.

471. THE GREAT PSYCHOLOGISTS
Historical introduction to some of the great psychologists and their classic works. 4 cr.

491. GENERAL TOPICS IN PSYCHOLOGY
New courses of general interest and focus are presented under this listing. Staff present material not normally covered in regular course offerings. May repeat but not duplicate areas. Course descriptions on file in the psychology offices during preregistration. Not for major credit. 4 cr.

Major Courses

511. INTRODUCTION TO PERCEPTION, LANGUAGE, AND THOUGHT
Human mental processes. Visual and auditory perception; language; attention; memory; thinking; problem solving; creativity. Interrelationships among these areas of human psychology. Prereq: Psych 401. 4 cr.

521. PRINCIPLES OF LEARNING AND THEIR APPLICATION
Principles developed from experimental study of human and animal learning; their theoretical integration; their application to the understanding of human behavior. Procedures for changing behavior in practical situations, related to theories of learning. Prereq: Psych 401. 4 cr.

522. BEHAVIORISM
Introduction to behaviorism as a philosophy of science. Some historical background, but concentration on modern behaviorism as exemplified in the works of B.F. Skinner. Prereq: Psyc 401. 4 cr.

531. PSYCHOBIOLOGY
The human as a biological machine; advantages and limits of such an approach for studying behavior. Perception, language, and thought; learning and memory; emotions from the point of view of physiology. Prereq: Psyc 401. 4 cr.

551. PSYCHOLOGY OF SEX ROLES
The psychology of women and men, and sex-role differences in socialization, personality, achievement motivation, altruism, agression, power, etc. Prereq: Psych 401. 4 cr.

561. CLINICAL APPROACHES TO HUMAN BEHAVIOR
Normal and abnormal behavior from the viewpoints of Freud, Rogers, learning theorists, existentialists, and others. Human behavior; clinical procedures of evaluating and modifying behavior. Nature of the clinical approach; no clinical training. Prereq: Psyc 401. 4 cr.

581. THE STUDY OF CHILD BEHAVIOR
The developing child in context of his/her society. Current problems in and influences on development of the child. Personality and cognitive development; exceptional children. Prereq: Psych 401. 4 cr.

601. STATISTISTICS AND METHODOLOGY IN PSYCHOLOGY
Design, procedure, statistical analysis, and decision making in psychological research. Substantive problems as illustrations of typical applications and underlying logic. Prereq: Psych 401. Required of all undergraduate majors. 4 cr.

602. EXPERIMENTAL PSYCHOLOGY
Experimental methods applied to psychological processes; principles of experimental design; methods of data analysis. Each student responsible for an original experiment. Prereq: Psyc 601. 5 cr.

621. LEARNING AND MOTIVATION
Learning and motivation related to environmental and biological determiners of behavior. Theory, research methods, and applications. Major concepts and recent research. Prereq: Psyc 401. 4 cr.

651. PSYCHOLOGY OF PERSONALITY
Major theories, methods of assessment, and research. Prereq: Psych 401. 4 cr.

652. SOCIAL PSYCHOLOGY
Behavior of individuals as affected by other individuals, groups, and society. Topics include attitude change and social influence, conformity, social interaction, interpersonal attraction, impression formation, research. Prereq: Psyc 401. 4 cr.

671. HISTORY OF PSYCHOLOGY
Survey of the history of psychology up to the 20th century. Major figures, theories, and developments. Relationship to developments in cultural history, philosophy, and the natural sciences. Beginnings of modern scientific psychology. 4 cr.

702. ADVANCED STATISTICS AND RESEARCH METHODOLOGY
Experimental design, analysis, and interpretation. Repeated measures, designs, trend analyses, nonparametric analyses, confounding, missing data, interpretation of interactions, and computer processing of data. Intended primarily for majors planning to attend graduate school. Prereq: Psyc 601 and one 700-level Psyc course. 4 cr. (Not offered every year.)

704. RESEARCH METHODS IN SOCIAL PSYCHOLOGY
Features, assets, liabilities, and appropriate applications of measurement, survey methods, field and laboratory experiments, and nonreactive methods. Philosophy of science, ethical responsibility, and artifact in research. Each student responsible for an original research project. Prereq: Psyc 601; 652. 4 cr.

705. TESTS AND MEASUREMENT
Testing intelligence, creativity, achievement, interests, and personality. Test construction; evaluation; relation to psychological theory, research, and practice. Prereq: Psyc 601. 4 cr.

711. SENSATION AND PERCEPTION
Anatomy, physiology, psychophysics, and perceptual processes of all the sensory modalities. Topics include stimulus definition, brightness and contrast, color vision, space and form, perceptual development, pitch, loudness, and auditory localization. Prereq: Psych 601. 4 cr.

712. PSYCHOLOGY OF LANGUAGE
Theories of language structure; functions of human language; meaning; relationship of language to other mental processes; language acquisition; indices of language development; speech perception; reading. Prereq: Psych 601 or permission. 4 cr.

713. COGNITION
Complex mental activities; consciousness and attention; concept formation; reasoning; problem solving; creative thinking; relationship between cognition and affective behavior. Prereq: Psych 601. 4 cr.

722. HUMAN LEARNING
Experimental study of human learning and retention. Memory, transfer, verbal learning, perceptual learning, concept learning, and observational learning. Methodologies typical of research in these areas. Prereq: Psych 601; 602 or 621. 4 cr.

723. APPLIED BEHAVIORAL ANALYSIS
Applications of learning theory to the solution of socially relevant problems. Appreciation of current research and theory in the field of applied behavior analysis. Prereq: Psyc 601; Psyc 602 or 621. 4 cr.

731. BRAIN AND BEHAVIOR
Relationships between the nervous system and behavior. Physiological, neural, and biochemical mechanisms underlying instinct, memory, learning, emotion, and consciousness in humans; evolution of these functions in lower animals. Prereq: Psyc 531 or an introductory physiology course recommended but not essential. 4 cr.

732. COMPARATIVE PSYCHOLOGY
Comparisons of the basic processes of sensation, motivation, learning, and social behavior in different species. Contemporary theories of behavior formulated by ethologists contrasted and compared with current theories in psychology. Prereq: Psyc 601. 4 cr.

755. SOCIAL PSYCHOLOGY OF SOCIAL ISSUES
Crime, violence in the family, aging, television, health, politics, and behavior of men and women. Specific social psychological processes applied to the nature and solution of each problem. Prereq: Psych 601 and 652. 4 cr. (Not offered every year.)

756. ENVIRONMENTAL PSYCHOLOGY
Human behavior as influenced by the natural and personmade physical environment. Coverage of research and theory on such topics as privacy, territoriality, crowding, personal space, urban stress, behaviorally-based design, paralinguistics, and behavior in natural settings. Prereq: Psych 601 and 652. 4 cr.

761. ABNORMAL PSYCHOLOGY
Disturbing behaviors; historical developments; viewpoints of etiology; identifying and understanding disruptive behavior; diagnostic implications for treatment as a function of varying theoretical viewpoints. Prereq: Psyc 601. 4 cr.

762. COUNSELING
Theories of counseling; ethical considerations; professional and paraprofessional activities in a variety of work settings. Prereq: Psyc 601. 4 cr.

771. SURVEY OF 20th CENTURY PSYCHOLOGY
Reassesses, extends, and integrates knowledge of 20th century psychology within historical perspective. Major figures, schools, systems, theories. Review of major fields of psychology. Useful as preparation for the Graduate Record Examination. Prereq: Psyc 401. 4 cr.

781. DEVELOPMENTAL PSYCHOLOGY
Current research and major theories; cognitive, personality, learning, and emotional development. Prereq: Psyc 601; Psyc 581 or HEc 525. 4 cr.

Special Courses

591. SPECIAL TOPICS IN PSYCHOLOGY
New or specialized courses are presented under this listing. Staff present material not normally covered in regular course offerings. May repeat but not duplicate areas. Course descriptions on file in the psychology offices during preregistration. Prereq: Psyc 401. 4 cr.

691. CRITICAL ISSUES IN PSYCHOLOGY
New or specialized courses reflecting current or historically important issues are presented under this listing. May repeat but not duplicate areas. Course descriptions on file in the psychology offices during preregistration. Prereq: Psyc 401; Psyc major or permission. 4 cr.

791. ADVANCED TOPICS
Advanced material in which instructor has specialized knowledge through research and study. May repeat but not duplicate areas. Course descriptions on file in the psychology offices during preregistration. Prereq: Psyc 601; 16 credits of psychology; /or permission. 4 cr.

793. EXTERNSHIP
Supervised practicum in one of several cooperating New Hampshire mental health/rehabilitation facilities. Coursework knowledge applied to meaningful work and team experience. Commitment includes a negotiated number of weekly work hours and weekly seminars. Supervision by institution personnel and the instructor. Course applications accepted beginning in March for fall term and October for spring term. Prereq: permission; psyc major; Psyc 601; additional psychology courses desirable. A maximum of 4 credits can count toward the minimum of 32 credits for Psyc major. Up to 8 cr.

794. ADVANCED EXTERNSHIP
Supervised advanced practicum experience in cooperating New Hampshire mental health/rehabilitation facilities. Expands and builds on experiences and skills acquired in Psyc 793 in a way not possible in the classroom. Commitment includes a negotiated number of hours of work per week and participation in weekly seminars. Supervision done by institution personnel and instructor. Course applications accepted beginning in October for spring term. Prereq: Psyc 793; permission. Maximum of four credits can count toward the minimum of 32 credits for Psyc major. Up to 8 cr. (Offered spring semester only.)

795. INDEPENDENT STUDY
A) Physiological; B) Perception; C) History and Theory; D) Learning; E) Social; F) Cognition; G) Statistics and Methods; H) Experimental; I) Personality; J) Developmental; K) Counseling; L) Psychotherapy; M) Research Apprenticeship; N) Teaching of Psychology (content area to be determined). Specific Independent Study opportunities are sometimes posted in the psychology offices. Arrangements to be made with a specific faculty member; enrollment by permission only. 1-4 cr.

Recreation and Parks (RecP)

CHAIRPERSON: Gus C. Zaso
ASSOCIATE PROFESSOR: Gus C. Zaso
ASSISTANT PROFESSORS: Robert D. Greenleaf, Lawrence A. Rondeau
ADJUNCT ASSISTANT PROFESSOR: Wilbur F. LaPage

400. IMPACT OF LEISURE
Issues which contribute to the emergence of a leisure-oriented society and significant problems which accompany the expansion of leisure opportunities. 4 cr.

454. SPECIAL FACILITY OPERATIONS
Management of public, private, and commercial recreation facilities. 4 cr.

455. INTRODUCTION TO RECREATION AND PARK SERVICES
Role of recreation and parks in contemporary society. 4 cr.

457. DYNAMICS OF LEADERSHIP AND PROGRAMMING
Leadership processes and their relationship to principles of program planning and evaluation. 4 cr.

501. SPECIAL POPULATIONS AND RECREATION
Development of an understanding of special population needs as they relate to therapeutic recreation services in local, state, and federal agencies. 4 cr.

543. COMPARATIVE ENVIRONMENTAL EDUCATION
Interdependent environmental analyses with application to recreational and educational situations. 4 cr.

544. OUTDOOR EDUCATION
Elements of programming as they relate to the school curriculum and school camping. 4 cr.

560. CAMPUS RECREATION SERVICES
Management of college unions and campus recreation resources in higher education. 4 cr.

564. FIELD WORK
Supervised experience in approved recreation and park agencies. Prereq: RecP major. 4-8 cr. Cr/F.

593. SPECIAL TOPICS
Specialized courses covering material not presented in regular course offerings. Description of topics available in department office during preregistration. Prereq: RecP 455. May be repeated but not in duplicate areas. 4 cr.

661. RECREATION RESOURCES MANAGEMENT
Park practices as they relate to location, management, and maintenance. 4 cr.

663. RECREATION AND PARK ADMINISTRATION
Theoretical and practical methods used in attaining organizational goals. 4 cr.

664. SAFETY AND SECURITY OPERATIONS
Accident prevention and security procedures as applicable to recreation and park systems. 4 cr.

667. RECREATION AND RESOURCE PLANNING
Master planning concepts which relate to public systems. 4 cr.

668. DESIGNING AND ENGINEERING
Practices involved in constructing indoor and outdoor recreation facilities. 4 cr.

771. LEGAL ASPECTS
Basic legal aspects of leisure-oriented services. 4 cr.

772. FINANCIAL ADMINISTRATION
Business procedures which relate to municipal finance and budgeting techniques. 4 cr.

793. ADVANCED TOPICS
Topics presented by instructors with specialized knowledge gained through professional practice, research, and study. Description of topics available in department office during preregistration. May be repeated but not in duplicate areas. 4 cr.

796. INDEPENDENT STUDY
Individual study and/or research relating to leisure-oriented topics. 1-4 cr.

798. SEMINAR IN LEISURE
Reviews of problems, trends, and current practices. 4 cr.

Religious Studies (R S)

COORDINATOR: Paul Brockelman

501. CONTEMPORARY APPROACHES TO THE STUDY OF RELIGION
A variety of contemporary methods for studying religion, as well as an analysis of such significant cross-cultural continuities in various religious traditions as mythology, ritual, canon, etc. 4 cr.

599. SPECIAL TOPICS
Studies of particular religious traditions, or periods within those traditions, or special topics and issues of concern within religious studies such as mythology, ritual, mysticism, etc. 4 cr.

695, 696. INDEPENDENT STUDY
Independent study of traditions, topics, or figures within the scope of religious studies. Before registration, student must formulate a project and secure consent of a cooperating department faculty member who will supervise the independent study. 2 or 4 cr.

699. SENIOR SEMINAR
A capstone experience intended to help students draw together their various studies in the field of religion. Prereq: any two courses in religious studies or permission. 4 cr.

Reserve Officers Training Corps

(See Aerospace Studies and Military Science)

Resource Economics

(See Institute of Natural and Environmental Resources)

Russian

(See Ancient and Modern Languages and Literatures)

School of Health Studies (SHS)

400. HEALTH-HUMAN VALUES
Physiological, emotional, social, and environmental factors affecting health. Basic health information to broaden understanding of health-related issues. Students examine their patterns of decision making in issues directly affecting their lives. 4 cr.

798. SPECIAL TOPICS IN HEALTH STUDIES
Students may explore areas related to specific professional health interests. May repeat but not duplicate subject areas. A) Communication Disorders; B) Health Administration and Planning; C) Medical Technology; D) Nursing; E) Occupational Therapy; F) Physical Education; G) Recreation and Parks; K) Survey of Therapeutic Approaches to Developmental Disabilities (interdisciplinary); H-J and L-Z) Interdisciplinary. Prereq: permission. 1-4 cr.

Secretarial Studies (Secr)

ASSOCIATE PROFESSORS: Doris E. Tyrrell, emerita; Myra L. Davis

401-402. SHORTHAND
Principles of Gregg shorthand followed by dictation and transcription. Prereq: proficiency in typing or Secr 405 or 407 taken concurrently. 4 cr.

405. PERSONAL USE TYPEWRITING
Practice in acquiring correct typewriting techniques, and in arranging letters and manuscripts. Open to students who do not know how to type. 2 cr. Cr/F.

407-408. TYPEWRITING
Beginning course, primarily for students interested in two semesters. 2 cr.

427. TYPEWRITING
To be taken instead of Secr 407 by students who have had a personal-use typewriting course. Class begins at midsemester. 1 cr.

Social Science (ScSc)

Courses coordinated by the chairperson of the Social Science Division, College of Liberal Arts.

681. INTERNSHIPS
Fieldwork in a state or local government department, agency, or institution, or in an approved private agency. Work will be under supervision of agency. Department chairperson or representative is responsible for arranging the program. Offered through Departments of History, Political Science, Psychology, Sociology and Anthropology, or the Whittemore School of Business and Economics. Prereq: senior standing. Variable to 16 cr.

Social Service (S S)

CHAIRPERSON: Pauline Soukaris
ASSOCIATE PROFESSORS: Betty Holroyd Roberts, Pauline Soukaris
ASSISTANT PROFESSORS: Richard J. Kaufman, Wilma Valenzuela
INSTRUCTOR: Robert E. Jolley

522. INTRODUCTION TO SOCIAL WELFARE POLICY: PROVISIONS
U.S. social welfare provisions: income, housing, employment, and health care. Program and policies in historical perspective: their auspices, goals, and operations for consumers from various social, racial, and ethnic groups. 4 cr.

523. INTRODUCTION TO SOCIAL WELFARE POLICY: SERVICES
Child and family, elderly, school, correctional, medical, and mental health. Programs, policies, and services in historical perspective: their auspices, goals, and operations for consumers for various racial, ethnic, and social groups. Weekly observational/participatory assignments at community agencies. Prereq: S S 522 or permission. 4 cr.

550. HUMAN BEHAVIOR AND SOCIAL ENVIRONMENT I
Introduction to human behavior and development as it influences and is influenced by multiple factors in the social environment, including individual genetic and biological composition, race, gender, age, socio-economic status, ethnicity, geographic location, physical appearance, and ability. How these factors operate throughout the life cycle. Provides a knowledge base and perspective to understand a client's behavior, attitude, and values in relation to the attitudes and values of the social work professional and the larger society. Prereq: S S 522; S S 523; major. 4 cr.

551. HUMAN BEHAVIOR AND SOCIAL ENVIRONMENT II
Continuation of 550. Agents of socialization that most significantly affect individual development and behavior, and a dynamic and changeable concept of social systems as they affect individual and group behavior in relation to the dominant society. Prereq: S S 550; major. 4 cr.

622. SOCIAL WORK PRACTICE I
Introduction to methods and practice. Basic principles, values, and ethics. Interviewing skills, problem assessment, social contracting. Skills training in lab sessions. Required for majors, should be taken in junior year. Prereq: S S 523 or permission. 4 cr.

623. SOCIAL WORK PRACTICE II
Continuation of S S 622. Delineation and study of intervention and change strategies differentiated with individuals, groups, and communities. Required for majors. Prereq: S S 622. 4 cr.

631. SOCIAL WELFARE FIELD EXPERIENCE
Majors will be placed in a social welfare setting for a minimum of 300 hours, concurrent with a weekly seminar on campus; individual arrangements with faculty coordinator. Required for majors. Prereq: S S 623 and permission. (No credit toward a minor.) 12 cr. Cr/F.

632. SPECIAL TOPICS IN SOCIAL WELFARE
Seminar for advanced majors. Topics may include income maintenance, alcoholism, health care, aging, child welfare, and mental health; to increase understanding of factors that influence program development and service delivery. Prereq: S S 631 or permission. 4 cr.

633. SEMINAR IN SOCIAL WORK METHODS
Analysis and comparison of change theories, intervention strategies, therapeutic techniques. Seminar format. Possible topics: techniques of group work, casework or community practice, behavior modification, and staff development and supervision. Prereq: senior major standing. 4 cr.

700. SOCIAL GERONTOLOGY
Theories, social problems, programmatic responses, and recent research on aging; emphasis on the psycho-social forces. Prereq: senior or graduate status; /or permission. 4 cr.

701. WOMEN AND AGING
An analysis of the major theories about the social conditioning of aging women and its effect in contemporary society. Human service response will be addressed. Psycho-social, biological, legal, and economic implications will be reviewed. Prereq: senior or graduate status or permission. 4 cr.

711. NEW TRENDS IN HUMAN SERVICE DELIVERY
Systematic examination of changing service delivery patterns/systems in the human services; obstacles/roadblocks to improved service delivery; analysis of specific programs, approaches, services, and issues in the field. Prereq: senior or graduate status or permission. 4 cr.

795, 796. READINGS AND RESEARCH IN SOCIAL SERVICE
Independent work under social service faculty guidance. Prereq: 12 hours of social service; permission. Variable 2, 4, or 6 cr.
Cr/F.

Sociology and Anthropology

CHAIRPERSON: Stuart H. Palmer
PROFESSORS: Melvin T. Bobick, Walter F. Buckley, Bud B. Khleif, Arnold S. Linsky, Stuart H. Palmer, Solomon Poll, Murray A. Straus
ASSOCIATE PROFESSORS: Charles E. Bolian, Peter Dodge, Richard E. Downs, Melville Nielson, Stephen P. Reyna, Frederick Samuels, Howard M. Shapiro
ASSISTANT PROFESSORS: Lawrence C. Hamilton, Barbara K. Larson
ASSISTANT PROFESSOR (PART-TIME) AND ARCHAEOLOGIST: Gary W. Hume
LECTURER: Howard Hecker
INSTRUCTOR: Deborah Winslow

Anthropology (Anth)

411. CULTURAL AND SOCIAL ANTHROPOLOGY
Cultural and social aspects of human behavior, particularly in relation to nonindustrial societies. Analysis of selected societies, institutions, and forms of social structure. 4 cr.

412. PHYSICAL ANTHROPOLOGY AND PREHISTORIC ARCHAEOLOGY
Human physical evolution and cultural prehistory; evolutionary theory and archaeological techniques. 4 cr.

512. INTRODUCTION TO WORLD ETHNOGRAPHY
Primarily for majors and minors, but open to all students. Historical and geographic factors, types of social and economic organization, and problems involved in the comparative study of human societies and institutions. Analysis of selected peoples in the major ethnographic areas. Prereq: Anth 411 or equivalent; /or permission. 4 cr.

514. METHOD AND THEORY IN ARCHAEOLOGY
Basic method and theory; techniques in recovering and interpreting data; laboratory exercises in ceramic and lithic analysis. Critical evaluation of archaeological literature. Prereq: Anth 412 or permission. 4 cr.

516. KINSHIP AND SOCIAL ORGANIZATION
The significance of kin and nonkin relations in human societies. Topics include the origins and evolution of human society, variations in the form and functions of marriage, family, and kin-based groups and selected nonkin relationships. Primary focus will be on nonindustrial societies. Prereq: Anth 411 or permission. 4 cr.

518. HISTORY OF ANTHROPOLOGICAL THEORY
Reading and discussion of the works of major theoreticians of American, British, and French schools. Selections from the works of Spencer, Morgan, Tylor, Boas, Kroeber, Lowie, Steward, White, Durkheim, Mauss, Lévi-Strauss, Malinowski, Radcliffe-Brown, Evans-Pritchard, and others are treated in terms of their contributions to the historical development of anthropology and their relevance to contemporary debates in anthropological theory. Prereq: Anth 411 or permission. 4 cr.

614. ECONOMIC ANTHROPOLOGY
Economics of nonindustrial societies; definition of economics; production, distribution, and consumption in selected societies; development. Prereq: Anth 411 or permission. 4 cr.

616. ANTHROPOLOGY OF RELIGION
Major anthropological theories of religion; analysis of religious beliefs as symbolic systems and their interrelations with ritual and other social institutions. Detailed study of specific religions. Prereq: Anth 411 or permission. 4 cr.

618. POLITICAL ANTHROPOLOGY
Political processes and structures in nonindustrial societies. Major topics: centralization of power and authority, legal systems, and warfare. Prereq: Anth 411 or permission. 4 cr.

625. FEMALE, MALE, AND SOCIETY
A critical, cross-cultural study of sex-related behavior in historical as well as contemporary perspective. Draws on anthropological, social-psychological, and sociological literature. Prereq: Anth 411 or Soc 400; /or permission. 4 cr.

630. ANTHROPOLOGICAL FIELD RESEARCH
Explores in theory and practice a range of approaches to doing field studies in anthropology. Techniques such as life histories, questionnaires, projective tests, participant observation, and field diaries will be explored in class and through active participation in a class research project. Prereq: Anth 411; one 500-level or higher anthropology course; /or permission. 4 cr.

697. SPECIAL TOPICS IN ANTHROPOLOGY
New or specialized courses presenting material not normally covered in regular course offerings. May be repeated, but not in duplicate areas. Course descriptions on file in department office during preregistration. A) Social organization; B) Economic Anthropology; C) Anthropology of Religion; D) Political Anthropology; E) Development; F) Cultural Ecology; G) Prehistoric Archaeology; H) Historic Archaeology; I) Cultural Resources Conservation; J) Lithic Analysis; K) Ceramic Analysis; L) Faunal Analysis; M) Human Evolution; N) Human Variation; O) Nomads. Prereq: Anth 411 or 412 (as appropriate); /or permission. 4 cr.

699. SENIOR THESIS
Independent work in the library or field; recommended for, but not confined to, majors intending to pursue graduate studies; required for honors candidates. Contact staff to obtain approval and arrange supervision. Should be taken next-to-last semester before graduation. 4 cr.

714. ANTHROPOLOGY OF COMPLEX SOCIETIES
Peasants, urban communities, race and ethnicity, stratification, local-national integration, the effects of colonialism, modernization, and social change. Primary emphasis is on the comparative and cross-cultural analysis of non-Western societies. Prereq: Anth 411 or permission.

731, 732. AREA STUDIES IN ARCHAEOLOGY
A) South America; B) Mesoamerica; C) North America; D) Other. Offered as staff is available and student needs dictate. Prereq: Anth 412; Anth 514; /or permission. 4 cr.

747. AREA STUDIES IN SOCIAL AND CULTURAL ANTHROPOLOGY
A) South America; B) Mesoamerica; C) North America; D) Oceania; E) Southeast Asia; F) Africa; G) Middle East; H) South Asia; I) Other. Offered as staff is available and student needs dictate. Characteristic ecological, historical, and socio-cultural factors. Analysis of selected societies and institutions. Prereq: Anth 411 or permission. 4 cr.

750. MIDDLE EAST: ISSUES OF ETHNICITY, WORK, AND IDENTITY
Community studies approach to such topics as: ethnicity and identity in the interrelationship of language, religion, and corporate membership in a community; ethnic division of labor; work, pluralism, and family networks; mobility and immobility; estates vs. classes. (Also offered as Soc 750.) 4 cr.

770. CULTURE, PERSONALITY, AND SOCIETY
A cross-cultural view of the development of personality as emergent from genetic, situational, and socio-cultural determinants; analysis of the dynamic interplay of socio-cultural and psychological behavior systems. Prereq: prior courses in sociology, anthropology, or psychology. (Also offered as Soc 770.) 4 cr.

775. SELECTED TOPICS IN ANTHROPOLOGICAL THEORY
Examination of selected approaches or schools of historical or current interest. May be repeated but not in duplicate areas. Course descriptions on file in department office during registration. A) Cultural/Social Anthropology; B) Archaeology; C) Physical Anthropology. Prereq: Anth 411 and 518, or 412 and 518, as appropriate; /or permission. 4 cr.

795, 796. READING AND RESEARCH IN ANTHROPOLOGY
A) Cultural/Social Anthropology; B) Anthropological Linguistics; C) Archaeology; D) Physical Anthropology. Prereq: 12 credits of anthropology; permission. Variable (normally 2-8) cr.

797. SPECIAL TOPICS IN ANTHROPOLOGY
New or specialized courses presenting material not normally covered in regular course offerings. May be repeated, but not in duplicate areas. Course descriptions on file in department office during registration. A) Social Organization; B) Economic Anthropology; C) Anthropology of Religion; D) Political Anthropology; E) Development; F) Cultural Ecology; G) Prehistoric Archaeology; H) Historic Archaeology; I) Cultural Resources Conservation; J) Lithic Analysis; K) Ceramic Analysis; L) Faunal Analysis; M) Human Evolution; N) Human Variation. Prereq: Anth 411 or 412 (as appropriate); /or permission. 4 cr.

Sociology (Soc)

400. INTRODUCTORY SOCIOLOGY
Human social and cultural relationships as revealed in customs and institutions. Social theory, methods and techniques of research, and current research findings. Laboratory-problem method of instruction is offered occasionally; students interested should register for the section identified as "Laboratory" in the *Time and Room Schedule.* 4 cr.

500. INTRODUCTION TO SOCIAL PSYCHOLOGY
Social structure and culture, and human behavior. Sociological analysis of behavior in interpersonal relationships, small groups, formal organizations, and other social units. Social psychological issues within various institutions of society. 4 cr.

520. THE FAMILY
An anthropological and institutional approach comparing societal customs and organizations. Laboratory-problem method of instruction is offered occasionally; students interested should register for the section identified as "Laboratory" in the *Time and Room Schedule.* 4 cr.

530. RACE AND ETHNIC RELATIONS
Majority-minority group relations; special attention to nature and results of Black-white and ethnic group relations in the United States. 4 cr.

540. SOCIAL PROBLEMS
Relation of customs and institutions to crime, delinquency, alcoholism, physical and mental diesease, sexual aberrations, poverty, old age, broken families, and racial and religious prejudices. Especially for nonmajors. 4 cr.

560. RURAL-URBAN SOCIOLOGY
Application of sociological and social psychological principles to the study of populations at various points on the rural-urban continuum. 4 cr.

599. CRITICAL ANALYSIS IN SOCIOLOGY
Basic skills essential to the study of sociology; development of critical reading of sociological literature through the practice of systematic evaluation of evidence and the process of theory construction; written and oral analysis of sociological classics; use of library resources. Required of sociology majors; open to other interested students. 4 cr.

600. SOCIAL INSTITUTIONS
Relationships among education, religion, economy, government, paedotrophic and inter-sex practices, art, and recreation. Cross-cultural approach. 4 cr.

601. METHODS OF SOCIAL RESEARCH
Cross-sectional and longitudinal survey design; direct and indirect measurement techniques; design of field and laboratory experiments; special topics. Prereq: major in sociology or social service; /or permission. 4 cr.

602. STATISTICS
Elementary applied statistical techniques; descriptive statistics, cross-tabulation, correlation, probability, hypothesis testing, analysis of variance. 4 cr.

611. HISTORY OF SOCIAL THEORY
Analysis of the writings of major contributors to the development of sociological theory from Plato to Max Weber. Special emphasis given to works of Marx, Weber, and Durkheim. 4 cr.

612. CONTEMPORARY SOCIOLOGICAL THEORY
Major schools, concepts, and issues in present-day sociological theory. Readings on functionalism, conflict theory, systems theory, critical theory, and hermeneutics. Prereq: Soc 611. 4 cr.

615. INTRODUCTORY CRIMINOLOGY
Scientific study of causes and control of crime. Indexes, rates, theories of crime and delinquency, police, courts, probation, prison, and parole. 4 cr.

620. STUDIES IN SOCIAL PSYCHOLOGY
Application of basic concepts of social psychology to a series of studies involving theoretical, methodological, and substantive issues. Prereq: Soc 500. 4 cr.

629. SMALL GROUPS
Interaction among individuals in small groups and between small groups; perception, attitude, and behavior. Analytical techniques are applied. A prior course in social psychology is recommended. 4 cr.

699. SENIOR THESIS
Independent work in the library or field; recommended for, but not confined to, majors intending to pursue graduate studies; required for honors candidates. Contact staff to obtain approval and arrange supervision. Should be taken next-to-last semester before graduation. 4 cr.

715. SOCIOLOGY OF CRIME AND JUSTICE
Seminar devoted to analyses of the relationships between violent, property, and "victimless" crime on the one hand and the police, judicial, and correctional components of criminal justice systems on the other. Prereq: Soc 615 or permission. 4 cr.

720. CURRENT DEVELOPMENTS IN SOCIOLOGY OF THE FAMILY
A current topic will be selected each semester, such as stratification and the family, intrafamily communication, power structure of the family, kinship in modern societies. Critical review of the literature; class or individual research project usually will be carried out. Prereq: 8 credits of sociology; Soc 520 recommended. 4 cr.

721. FAMILY INTERACTION
Analysis of family interaction from a sociological perspective. Consideration of individual family members, relationships, and the family as a unit using a social systems approach. Prereq: Soc 400 or permission. 4 cr.

735. COMPLEX ORGANIZATIONS
Comparative study of the structure and dynamics of complex, formal organizations (business, military, political, and governmental, educational, medical); power and social control; organizational processes, performances, and effectiveness; impact on persons and societies. Prereq: permission. 4 cr.

740. CULTURE CHANGE
Various types of society; development of theory. Descriptive studies of institutional as well as theoretical materials selected from the writings of Comte, Marx, Spencer, Durkheim, Spengler, Sorokin, Redfield, and others. 4 cr.

741. SOCIAL CHANGE AND SOCIETAL DEVELOPMENT
Comparative, interdisciplinary approach. Interrelationships among economic, political, and social factors in determining the structure, dynamics, character, and level of development of societies. Prereq: permission. Soc 740 recommended. 4 cr.

745. SOCIAL STRATIFICATION
Pattern of distribution of economic, honorific, and political variables within the populations of complex societies; allocation of personnel to the roles in question, notably through occupational mobility; and the impact of such processes upon behavior, both individual and social. Prereq: Soc 400 or 600. 4 cr.

750. MIDDLE EAST: ISSUES OF ETHNICITY, WORK, AND IDENTITY
Community studies approach to such topics as: ethnicity and identity in the interrelationship of language, religion, and corporate membership in a community; ethnic division of labor; work, pluralism, and family networks; mobility and immobility; estates vs. classes. (Also offered as Anth 750.) 4 cr.

757. SOCIAL INSTITUTIONS OF LATIN AMERICA AND THE CARIBBEAN
Selective analysis of distinctive institutions and social systems, with particular attention to social aspects of the process of modernization. Prereq: permission. 4 cr.

761. POPULATION DYNAMICS
Major population trends including changes in birth and death rates, population characteristics, mobility, migration, world population growth, population problems, and policies of countries at different stages of economic development. Interrelationship of population and society. 4 cr.

770. CULTURE, PERSONALITY, AND SOCIETY
A cross-cultural view of the development of personality as emergent from genetic, situational, and socio-cultural determinants; analysis of the dynamic interplay of socio-cultural and psychological behavior systems. Prereq: prior courses in sociology, anthropology, or psychology. (Also offered as Anth 770.) 4 cr.

780. SOCIAL CONFLICT
Nature, setting, and initiation of social conflict, its dynamics, and factors affecting its course and outcome. Prereq: permission. 4 cr.

785. THE STUDY OF WORK
Understanding society through the structure of work. Case studies, in an ethnographic manner, of high-status and low-status occupations to provide understanding of social processes and interrelationships in the social structure. 4 cr.

790. APPLIED SOCIOLOGY
1) Current level of use of sociological knowledge; 2) the advocate, consultant, and researcher roles in applied settings; 3) techniques of applied research; 4) implications of applied sociology, including ethical problems. Each student will focus on a social problem and write a paper covering the above issues. Applied projects where possible. Prereq: Soc 601. 4 cr.

795, 796. READING AND RESEARCH IN SOCIOLOGY
A) Communications; B) Criminology; C) Culture Change; D) Culture and Personality; E) Deviant Behavior; F) Family; G) Population; H) Rural-Urban; I) Social Control; J) Social Differentiation; K) Social Movements; L) Social Psychology; M) Social Research; N) Social Theory. Prereq: 12 credits of sociology or permission. 2-8 cr.

797. SPECIAL TOPICS IN SOCIOLOGY
New or specialized courses presenting material not normally covered in regular course offerings. May be repeated, but not in duplicate areas. Course descriptions and prerequisites on file in department office during registration. A) Criminal Justice Field Work; B) Sociology of Crime and Justice; C) Sociology of Mental Health and Illness; D) Illness and Society; E) The Holocaust; F) Socio-Linguistics; G) Social Class and Family Patterns; H) Measurement in Sociology; I) Violence in the Family; J) Post-Industrial Society; K) Political Sociology; L) Bio-Sociology; M) Social Evolution; N) Social Differentiation; O) Modernization; P) Blacks in the Americas; Q) Religious Movements; R) Fieldwork; S) Cults and Sects. 4 cr.

Soil Science

(See Institute of Natural and Environmental Resources)

Spanish

(See Ancient and Modern Languages and Literatures)

Technology (Tech)

DEAN: Richard S. Davis

The following courses are not necessarily offered every year.

405. INTRODUCTION TO COMPUTER TECHNOLOGY AND APPLICATIONS
Computer hard- and software; demonstrations, some "hands-on" experience with hardware, and some programming. Advantages and limitations of computers with respect to various applications (e.g., data processing, automation, education); impact on society (e.g., employment, privacy, war). No credit subsequent to C S 410, E E 712, 714. 4 cr.

610. INTRODUCTION TO OCEAN ENGINEERING
Seminar dealing with engineering problems in fields of current oceanographic interest. Marine biology, saturation diving systems, and physical oceanography. Engineering faculty and other experts in ocean science and engineering. Prereq: permission. 4 cr.

650. COOPERATIVE WORK EXPERIENCE
Course required of all students participating in the College of Engineering and Physical Sciences Cooperative Program during employment semesters. Prereq: permission. 0 cr. Cr/F.

683. TECHNOLOGY: ITS ROLE AND FUNCTION IN SOCIETY
Impact of technology on social systems with current and historical examples. Interrelationships between social customs, psychological responses, physical needs, and technological developments. Decision-making process in technological change; interrelationship between technology and public policy. Prereq: junior and senior standing; permission. 4 cr.

697. OCEAN PROJECTS
Students work as members of interdisciplinary project teams on contemporary ocean-related problems under the guidance of a faculty adviser. Student team defines problem, prepares a budget, conducts literature surveys, engages in dialogue with experts in the ocean community, deals with vendors, designs and builds a working engineering model, gathers and analyzes scientific data, or conducts a comprehensive study, makes interim reports, and defends its results before a jury of experts. Prereq: normally senior standing and permission of the course director. A year-long course: 2 credits each semester, 4 credits total, an "IA" grade (continuous course) given at the end of the first semester. 4 cr.

Theater and Communication (ThCo)

CHAIRPERSON: David J. Magidson
PROFESSORS: Joseph D. Batcheller, John C. Edwards
ASSOCIATE PROFESSORS: Carol Lucha Burns, Gilbert B. Davenport, David J. Magidson, Joshua Meyrowitz, Wilburn Sims
ASSISTANT PROFESSORS: Raymond J. Bernier, Jean M. Brown, Kenneth Sweet, Tracey Bernstein Weiss
INSTRUCTOR: Patricia Fleming-Desrosiers
LECTURERS: Kathy Anastasion, Paula Geyser, Susan E. Goldin, Paul Goodwin, Judith Hartwell, Jeffrey Martin, Jean Mattox, C. Lawrence Robertson, Elizabeth Sanner, Thomas E. Scharff, Peter Spain, James H. Tolhuizen

Communication

402. COMMUNICATION I
Introduction to human communication from a broad liberal arts perspective; issues include the impact of language and communication through the processes of intrapersonal, interpersonal, group, public, and mass communication. Freshman, sophomore priority. 4 cr.

403. PUBLIC SPEAKING
Sensitizes speakers and listeners; understanding and adapting to receivers, idea selection and development, message organization, and delivery. Nonverbal communication. 4 cr.

404. INTRODUCTION TO ARGUMENTATION
Principles of inquiry and advocacy. Philosophical and logical frameworks of argument; analysis, discovery and testing of data; forms of argument; testing of argument; patterns of proof and evidence. Argumentation as advocacy. 4 cr.

405. ARGUMENTATION WORKSHOP
Basic principles of rational decision making through argumentation. Application in debate formats. May be repeated. Prereq: ThCo 404. 2 cr.

455. INTRODUCTION TO MASS COMMUNICATION
Nature, development, and effects of mass media. Overview of mass communication history and theory. 4 cr.

501. ARGUMENTATION II
Argument and advocacy as action on minds by means of discourse. Presumptions, hierarchies, loci, presentation of data and the form of the discourse, ethical and logical duties of the advocate. Examinations of arguments by politicians, lawyers, or others who advance propositions of fact, value, or policy. Prereq: ThCo 404; ThCo 405; /or permission. 4 cr.

502. INTERPERSONAL LABORATORY
Integrates interpersonal theory and practice in a laboratory setting. Prereq: ThCo 402 and permission. 4 cr.

503. INTRODUCTION TO GROUP PROCESSES
Communication behavior in small groups. Problem-solving procedures, leadership, behavioral patterns, communication interaction patterns. Prereq: ThCo 402 or 403; /or permission. 4 cr.

506. PERSUASION
Advanced course on problems of influencing human behavior. Practical applications. Prereq: ThCo 403 or permission. 4 cr.

533. INTRODUCTION TO FILM
Film: history, technique, and social relevance; as an art form. Comparison of film to drama and the novel. Showing and examination of works by such filmmakers as Bergman, Fellini, Truffaut, Kurosawa, Hitchcock, and Welles. (Also offered as Engl 533.) 4 cr.

556. INTRODUCTION TO TELEVISION PRODUCTION
Theory and actual studio experience, practice, and procedures. All aspects of television work and formats. Students operate every piece of studio equipment and write, produce, and direct several shows. Prereq: ThCo 455 or permission. 4 cr.

560. FILMMAKING
Theory of cinematic construction grounded in production work. Visualization, storyboarding, pictorial composition, creation of filmic reality, narrative devices, and editing. Students produce own short films. Lab fee. Prereq: permission. 4 cr.

567. IMAGES OF WOMEN IN THE MEDIA
Portrayal of women in a variety of media. Communication research methodologies employed to examine media attempts to persuade, reinforce, and manipulate attitudes. 4 cr.

162

572. LANGUAGE AND BEHAVIOR
Human symbol-using capacity and effects of language on behavior. Ways in which symbols help create individual realities, reflect levels of personal judgment and adjustment, facilitate or hinder interpersonal communication. Application to verbal and nonverbal communication and contemporary and social issues. 4 cr.

580. WRITING BROADCAST NEWS
Introduction to radio and television news writing, editing, and delivering. Emphasis on practical radio news writing experience. Prereq: permission. 4 cr.

595. SPECIAL TOPICS IN COMMUNICATION
Individual or group projects primarily in the communication option. By permission and arrangement with appropriate faculty. (May be repeated.) 2, 4, 6, or 8 cr.

602. THEORIES OF INTERPERSONAL COMMUNICATION
Contemporary perspectives on interpersonal communication; analytical emphasis on human communication behavior. Prereq: ThCo 402; at least one 500-level communication course. 4 cr.

603. THEORIES OF GROUP COMMUNICATION
Historical foundations and contemporary perspectives in group communication; analytical emphasis on human communication behavior. Prereq: ThCo 402; at least one 500-level communication course. 4 cr.

608. COMMUNICATION ANALOGS
Pragmatic analysis of communication problems. The level structure of human communication, system interaction and metacommunication, and paradoxes of communication behavior are examined through analogs and axioms of behavior as communication. Prereq: ThCo 402; at least one 500-level communication course. 4 cr.

630. PSYCHOLOGY OF COMMUNICATION
Concept-reference; vocal, visual, and verbal cues and attention. Prereq: ThCo 402; at least one 500-level communication course. 4 cr. (Not offered every year.)

632. COMMUNICATION THEORY
Terminology, concepts, theoretical models, functions, levels, modes and media, and role taking in human communication. Prereq: ThCo 402; any 500-level communication course; /or permission. 4 cr.

637. HISTORY AND LAW OF MASS COMMUNICATION
Media regulation discussed in historical/social contexts in which it took place. Begins with movable type and goes through present modes of regulation including executive, FCC, and the courts. Prereq: ThCo 455 and permission. 4 cr. (Offered every other year.)

656. PRINCIPLES OF RHETORICAL CRITICISM
Roles and methods of rhetorical critics. Historical background to rhetorical-critical structures and processes including neo-Aristotelian criticism and Burkeian criticism. Critical principles and practices. Seminar. Prereq: ThCo 403 or permission. 4 cr.

658. MEDIA ANALYSIS AND CRITICISM
Approaches and methodologies for media criticism. Analysis of sample studies. Students work on original media analysis projects. Prereq: ThCo 455 or permission. 4 cr.

673. EXPERIMENTAL AND DESCRIPTIVE STUDIES IN ORAL COMMUNICATION
Prereq: permission. (May be repeated.) 4 cr.

695. COMMUNICATION SEMINAR
An upper-level seminar; variable topics in communication research, theory, and practice. May be repeated for different topics. 4 cr.

750. WRITING FOR PERFORMANCE
See theater offerings. 4 cr.

771. CRITICISM OF CONTEMPORARY RHETORIC
Applies rhetorical-critical systems and principles. Campaign rhetoric, agitative rhetoric, the rhetoric of religion, the rhetoric of militarism, the rhetoric of diplomacy, and the rhetoric of social movements. Course content variable. Prereq: ThCo 656 or permission. 4 cr.

772. MEDIA AESTHETICS/MEDIA THEORY
Seminar. Focused analysis of specific aesthetic and theoretical principles of film, television, radio, and other media. Application to current examples in politics, advertising, entertainment, etc. Course content variable. Prereq: ThCo 455 or permission. 4 cr. (May be repeated with permission; not offered every year.)

783. THEORIES OF LANGUAGE
Nature, uses, and roles of language. Representative theorists include Carroll, Piaget, Sapir, Whorf, Vetter, Vygotsky, Weiner, Chomsky, Labov, Steward, Ogden and Richards, Ruesch, and Sullivan. Prereq: permission; or ThCo 572 and 673. 4 cr. (Not offered every year.)

Dance

461. MODERN DANCE I
An introductory course which includes techniques and improvisation as well as lectures in history and theory. 4 cr.

462. BALLET I
Introductory course: technique; historical development of ballet. 4 cr.

463. THEATER DANCE I
Introductory course; techniques; improvisation, lectures on jazz, ethnic, and other theatrical dance forms. 4 cr.

470. THEATER MOVEMENT
Stage movement for actors. Open to theater majors only. 2 cr.

561. MODERN DANCE II
Intermediate level course which includes techniques and improvisation. Prereq: ThCo 461 or permission. May be repeated for credit. 2 cr.

562. BALLET II
Extension of Ballet I syllabus; emphasis is on technique, with additional step vocabulary. Prereq: ThCo 462 or permission. 2 cr.

563. THEATER DANCE II
Technique; Afro-Cuban, modern, and East Indian dance; body movement through exercises and combinations involving stretch, strength, and flexibility. Prereq: ThCo 463 or permission. 2 cr.

633. DANCE COMPOSITION I
Practical, developmental approach to process of creating dances. Prereq: ThCo 561, 562, 563, or permission. 2 cr.

634. DANCE COMPOSITION II
Use of music; group choreography. Prereq: ThCo 633. 2 cr.

638. THE DANCE
Historical and philosophical consideration of dance trends. 4 cr.

640. LABANOTATION
Study and practice of recording human movement by the method of Labanotation. Prereq: permission. 2-4 cr.

661. MODERN DANCE III
Advanced-level course in technique and composition. Prereq: ThCo 561 or permission. May be repeated for credit. 2 cr.

684. SPECIAL TOPICS IN DANCE
Exploration of topics agreed upon by students and instructor. Topics vary. May be repeated. 2-4 cr.

732. CHOREOGRAPHY
Theoretical and practical consideration of the creative and aesthetic aspects of ballet, modern, and jazz dance. Prereq: ThCo 634 or permission. 4 cr.

Theater

435. INTRODUCTION TO THEATER (THEATER AND ITS DRAMA I)
Emphasis on modern theater forms; e.g., legitimate, musical, cinema, television. Survey of theater areas, personnel, and methods. Attendance at University Theater and Cultural Events productions. Minimal participation in laboratory and major productions. 4 cr.

436. HISTORY OF THEATER AND DRAMA (THEATER AND ITS DRAMA II)
History and theory in its social framework from the beginnings to 1800. 4 cr. (Not offered every year.)

438. HISTORY OF THEATER AND DRAMA (THEATER AND ITS DRAMA III)
1800 to present. 4 cr. (Not offered every year.)

457. ORAL INTERPRETATION
Analysis of literature for performance; demonstration and experimentation with performance methods; development of a critical standard for evaluation of performance and literature. 4 cr.

459. STAGECRAFT (SCENIC ARTS I)
Stage scenery construction and painting. Properties, sound, and backstage organization. Survey of costumes and lighting. Practical application in University Theater productions. 4 cr.

475. STAGE MAKEUP
Fundamentals of juvenile, old age, character, and special stage makeup techniques. Prereq: permission. Lab fee: $20. 2 cr.

481. SUMMER REPERTORY THEATER WORKSHOP
1) Class in voice, movement, makeup, and improvisation taught by the directors and professional actors of the resident company. 2) Technical aspects of scenery, costumes, lighting, publicity. 3) Performance in Summer Theater production with experienced resident actors. Admission to workshop by audition only. Offered in the eight-week summer session. 8 cr.

520. EDUCATION THROUGH DRAMATIZATION
Drama techniques applied to the classroom, including puppetry, storytelling, involvement theater. 4 cr.

541. ARTS ADMINISTRATION
Contemporary arts administration; theories and techniques of cultural resource development, organization, structure, labor relations, marketing, consumer behavior, public relations, fund raising, audience development, and long-range planning. 4 cr.

546. STAGE COSTUME DESIGN AND EXECUTION (SCENIC ARTS II)
Costume history, styles, design theory, patternmaking, and construction. Prereq: permission. 4 cr.

547. STAGE PROPERTIES
Research and manufacture of period and modern stage, trim, and hand properties. Prereq: ThCo 459. 4 cr.

548. STAGE LIGHTING DESIGN AND EXECUTION (SCENIC ARTS III)
Elementary electricity, design theory, instrumentation, control, and practice. 4 cr.

549. VOICE AND DICTION I
Based on individual needs; particular reference to theater, television, radio. Individual and group practice sessions. Coreq: ThCo 551. Prereq: permission. 2 cr.

550. VOICE AND DICTION II
Basic skills for oral interpretation, theater, etc., including analysis and development of dialects. Coreq: ThCo 552. Prereq: ThCo 549. 2 cr.

551. ACTING I
Development of fundamental vocal and physical stage techniques for actors and directors through exercises, improvisation, and theater games. Should be taken concurrently with ThCo 549. 2 cr.

552. ACTING II
Application of prior training in ThCo 551 (prerequisite) to building characterizations in scenes and short plays. Should be taken concurrently with ThCo 550. 2 cr.

583. PUPPETRY
Introduction to puppetry as an art form, construction techniques, class production. Students provide own materials. 4 cr.

621. CREATIVE DRAMATICS
Exploration of drama techniques leading to design and execution of drama sessions with children in class. Prereq: permission. 4 cr.

622. THEATER FOR CHILDREN
The art of story theater production, storytelling, and involvement for both school and recreation programs. Students will observe and take part in the production of a play for children. 4 cr.

624. MUSICAL THEATER FOR CHILDREN
Musical production and writing techniques. Students take part in actual production. 4 cr.

627. METHODS OF EDUCATION THROUGH DRAMATIZATION
Materials and technique practicum for teaching material in ThCo 520. (Division of Continuing Education only.) Prereq: permission. 2-4 cr.

652. SCENE DESIGN (SCENIC ARTS IV)
Stage drafting, modules, materials, design theory, and styles. Individualized exercises, final project. Prereq: ThCo 459. 4 cr.

653. PERFORMANCE PROJECT
Application of acting and directing theory to assigned responsibilities in a University Theater production or to an individual performance project. Prereq: ThCo 551; 552; permission. To be taken in conjunction with ThCo 654, but not concurrently. May be repeated to 4 cr. 2 cr.

654. SCENIC ARTS PROJECT
Application of experience in design and technical aspects to assigned responsibilities in a University Theater production or to an individual project or presentation. Prereq: ThCo 459; 652; permission. To be taken in conjunction with ThCo 653, but not concurrently. May be repeated to 4 cr. 2 cr.

655. MUSICAL COMEDY WORKSHOP
Emphasis on developing audition, performance, and directing techniques, analysis. By audition only. 4 cr.

657. DIRECTING
Continuation of ThCo 552 (prerequisite). The director and performer develop interaction of the character. Ensemble playing. Full directing responsibility for a one-act play. 4 cr.

693. THEATER MANAGEMENT I
Theater organization, fund raising, public relations, audience development, and business and box-office management of University Theater projects. Special topics may be explored. Prereq: four courses in theater. 4 cr.

729. COMMUNITY-ORIENTED DRAMA PROGRAMS
Students develop programs and work in communities. 4 cr.

730. THEATER MANAGEMENT II
Theory and technique of theater management applied to a specific assignment; may involve internships with professional, community, or educational theaters. Prereq: ThCo 693. 4 cr.

741. PLAY ANALYSIS FOR PRODUCTION
Analysis and discussion to develop production concepts for actors, technicians, directors, designers, teachers. Prereq: ThCo 435, 436, or 438; either 459, or 551 and 552. 4 cr. (Not offered every year.)

750. WRITING FOR PERFORMANCE
Playwriting; radio, television, and film. Emphasis will vary. Focus on original work with possible performances in other classes. May be taken three times for credit. Prereq: permission. 4 cr.

755. MUSICAL THEATER STYLES
Representative scripts and scores depicting various American musical performance styles. Prereq: ThCo 655. Lab. 4 cr.

758. ACTING III
Continuation of ThCo 657 and of the sequence begun in ThCo 551 and 552. Styles of drama for the actor and director. Greek, Shakespearean, 18th-century comedy, and 19th-century realism. Prereq: ThCo 551; ThCo 552; ThCo 657; /or equivalent. 4 cr.

768. GROUP INTERPRETATION
Choric speaking, reader's theater, chamber theater, and other forms of group interpretation in theory and practice. Prereq: ThCo 457. 4 cr.

781. THEATER WORKSHOP FOR TEACHERS
Intensive seminar-workshop. Rehearsal techniques, theater production, and stage direction; work in lab and in summer repertory theater production as applicable to secondary-school theater. Offered in the summer session. 4 cr.

782. THEATER WORKSHOP FOR TEACHERS
Continuation of ThCo 781 (not a prerequisite). Offered in the summer session. 4 cr.

General

691. LABORATORY OR FIELD EXPERIENCE
Taken in the senior year. 4 cr.

697. SENIOR SEMINAR
Divisional and departmental meetings as preparation for senior project; overview of recent developments and trends in the oral-communication arts and sciences. Prereq: senior standing. 2 cr.

698. SENIOR PROJECT
Further development and completion of senior project. Prereq: senior standing. 2 cr.

795, 796. INDEPENDENT STUDY
Advanced individual study in one of the three areas of the department. Could be combined with senior project (for majors) for a total of 12 credits in the same semester if the student wishes to study off-campus. Project is to be developed with supervising instructor. May be repeated. 2, 4, 6, or 8 cr.

Thompson School of Applied Science (TSAS)

DIRECTOR: Lewis Roberts, Jr.

452. PLANT PROPAGATION
Reproduction of plants for horticultural purposes by sexual and asexual methods. Seeds, cuttings, separation, division, layering, grafting, budding, and in vitro propagation. Prereq: APS 251 or permission. Lab. 3 cr.

453. NURSERY CULTURE AND OPERATION
Development of a nursery business from site selection to marketing the finished product. Special attention to managing the operation. Prereq: APS 247 or permission. Lab. 3 cr.

457. CONTROLLED GROWTH STRUCTURES
Various growth structures used in the horticultural industry: greenhouses, lath houses, cold frames, etc.; construction, selection of heating, watering systems, scheduling of light requirements, and efficient use of space. Prereq: permission. Lab. 4 cr.

458. SPRING TRANSPLANT PRODUCTION
The study of leading bedding/annual plants, vegetable seedlings, perennials, and herbs, including cultural requirement, crop timing, distribution systems, and marketing principles. Prereq: permission. Lab. 3 cr.

459. FLORICULTURAL CROP PRODUCTION
The study of leading cut flower crops, potted plants, and bulbous crops including cultural requirement, crop timing, harvesting procedures, distribution systems, and marketing principles. Prereq: permission. Lab. 3 cr.

Women's Studies (W S)

COORDINATOR: Josephine Donovan

401. INTRODUCTION TO WOMEN'S STUDIES
Interdisciplinary survey of the major areas of women's studies: women's history, cross-cultural perspectives, women in literature, psychology of women, etc. Basic principles and concepts fundamental to more advanced women's studies research. Topics vary. Recommended for W S minors. 4 cr.

595. SPECIAL TOPICS IN WOMEN'S STUDIES
In-depth study of topics not covered in regular course offerings. Prereq: permission. 4 cr.

698. SENIOR SEMINAR
Intensive study of specialized topic for advanced students. Topics vary with instructor. Prereq: permission. Preference given to women's studies minors who have completed 12 W S cr. Barring duplication of topic, may be repeated for credit. 4 cr.

795. INDEPENDENT STUDY
For advanced students who have the preparation to carry out an individual project of supervised research on a specific Women's Studies topic. Preparation should include WS 401 or equivalent, and/or other women's studies courses. Prereq: permission of instructor and Women's Studies Coordinator. Barring duplication of topic, may be repeated for a maximum of 8 cr. 1-4 cr.

Wildlife Management

(See Institute of Natural and Environmental Resources)

Zoology (Zool)

CHAIRPERSON: John E. Foret
PROFESSORS: Lorus J. Milne, emeritus; Emery F. Swan, emeritus; Edythe T. Richardson, emerita; Arthur C. Borror, Wilbur L. Bullock, Frank K. Hoornbeek, John J. Sasner, Philip J. Sawyer, Paul A. Wright
ASSOCIATE PROFESSORS: Paul E. Schaefer, emeritus; Robert A. Croker, John E. Foret, James F. Haney, Larry G. Harris, Marcel E. Lavoie, Edward K. Tillinghast
ASSISTANT PROFESSORS: Edward N. Francq, Roderick M. Smith, James T. Taylor, Charles W. Walker, Winsor H. Watson, III
LECTURER: Abigail R. Lumsden

412. PRINCIPLES OF ZOOLOGY
Concepts of animal biology, introduction to ecological relationships, anatomy, physiology, embryology, taxonomy, and evolution. Intended principally for majors in the biological sciences. Lab. 4 cr.

504. HEREDITY AND EVOLUTION
Gene and chromosomal basis of variation and evolution; chemical, physical, and statistical concepts. Prereq: biological science or health studies major; /or permission. (Students may not receive credit for both Zool 504 and 604.) 4 cr.

507-508. HUMAN ANATOMY AND PHYSIOLOGY
All systems in human body. Laboratories: a dissection of preserved cats and experiments with living tissues. Lab fee $5. (Students may not receive credit for both Zool 507-508 and Zool 527.) 4 cr.

518. VERTEBRATE MORPHOLOGY
Basic morphological features of vertebrates. Structure of the major systems at macroscopic and microscopic levels. Prereq: Zool 412. Lab. 4 cr.

527. VERTEBRATE PHYSIOLOGY
Principles and comparative function of vertebrate systems; cell, organ, and system levels. Prereq: Zool 412, 518; Chem 403-404. Lab. (Students may not receive credit for both Zool 527 and Zool 507-508.) 4 cr.

528. INTRODUCTORY INVERTEBRATE ZOOLOGY
Lecture and laboratory survey of invertebrate phyla; systematic morphology, phylogeny, and natural history. Prereq: Zool 412 or equivalent. Lab. 4 cr.

537. COMPARATIVE INVERTEBRATE PHYSIOLOGY
Principles and comparative function of cell, organ, and system levels of invertebrate respiration, circulation, fluid regulation, energetics, coordination, and neuroendocrine mechanisms. Prereq: Zool 528 or equivalent; Chem 403-404. Lab. 4 cr.

542. ORNITHOLOGY
Identification and biology of birds, especially those of northeastern United States. Field trips, laboratory, and lectures. Prereq: one semester of biology. 4 cr.

560. ANATOMY AND BEHAVIOR OF THE GULL
Daily lectures; lecture demonstrations, laboratories, and field work. Functional anatomy of all organ systems, with emphasis on sensory, nervous, digestive, and respiratory systems. The large nesting colonies of two species of gulls on Appledore Island will be used to demonstrate territoriality, aggression, mating, and other basic patterns of gull behavior. Prereq: one course in college level biology. Staff. 1 cr. Cr/F. (Summer only.)

596. INTRODUCTION TO DESERT MOUNTAIN ECOLOGY
Field comparisons of plant and animal communities in habitats ranging from Chihuahuan desert through spruce/fir forests. Offered in the Chiricahua Mountains of southeast Arizona. Travel and living expenses. Interested students should contact instructor in September. Prereq: permission. 2 cr. (Winters only.)

604. PRINCIPLES OF GENETICS
Chemical and physical basis of inheritance; genes and chromosomes as units of mutation; genes in populations. Prereq: basic laboratory course in biological sciences. Organic chemistry and college math or statistics suggested. (Offered as PlSc 604 alternate semester.) Students may not receive credit for both Zool 504 and 604. 4 cr.

628. DEVELOPMENTAL BIOLOGY OF THE INVERTEBRATES
Principles of animal development including metamorphosis and regeneration in representative invertebrates. Prereq: Zool 528. Lab. 4 cr.

629. DEVELOPMENTAL BIOLOGY OF THE VERTEBRATES
Principles of animal development including metamorphosis, regeneration, and aging in selected vertebrates. Prereq: Zool 518, 527, and 604. Lab. 4 cr.

674. FIELD MARINE SCIENCE
Daily lectures; laboratory and field work. Offered at the Isles of Shoals in cooperation with Cornell University. An initial overview of the marine sciences, emphasizing living material in natural habitats; biology of intertidal plants and animals; biological oceanography; ichthyology; and fisheries. Also introductory physical and chemical oceanography, marine geology, marine ecology, and the effects of human activity on the marine environment. Prereq: at least a full year of college biology. 6 cr. Cr/F. (Summers only.)

704. COMPARATIVE ENDOCRINOLOGY
Endocrine organs; relationship to control of the internal environment, growth, development, and adaptation to external environment. Prereq: Zool 518; Zool 527; organic chemistry. 4 cr.

707. HUMAN GENETICS
Inheritance patterns; gene and chromosome mutation rates and effects; linkage and gene frequency. Prereq: Zool 604 or equivalent; /or permission. 4 cr. (Not offered every year.)

711. NATURAL HISTORY OF COLD-BLOODED VERTEBRATES
Classes of poikilothermic vertebrates; their habits, habitats, and life histories in eastern North America. Prereq: general zoology; Zool 518. Lab. 4 cr.

712. MAMMALOGY
Origins, diversification, reproduction, ecology, behavior of mammals. Identification of local forms. Prereq: Zool 518. Lab. 4 cr.

713. ANIMAL BEHAVIOR
Individual and social behavior. The role of anatomy, physiology, ecology, and prior experience. Techniques and practical application. Prereq: one year of zoology. Lab. 4 cr.

715. NATURAL HISTORY OF MARINE INVERTEBRATES
Field and laboratory course; inshore marine invertebrate metazoan animals of northern New England. Identification, classification, habitat preferences, and behavior. Work (collection and observation) constitutes a major part of the course. Some travel expense. Prereq: general zoology. 6 cr. (Summer only, not offered every year.)

717. GENERAL LIMNOLOGY
Special relationships of freshwater organisms to the chemical, physical, and biological aspects of the aquatic environment. Factors regulating the distribution of organisms and primary and secondary productivity of lake habitats. Prereq: Biol 541 or equivalent. 4 cr.

719. FIELD LIMNOLOGY
Freshwater ecology examined through laboratory exercises with freshwater habitats. Methods to study freshwater lakes; interpretation of data. Seminars and occasional Saturday field trips. Prereq: present or prior enrollment in Bot 717, Zool 717, or equivalent; permission. 4 cr.

166

720. FIELD MARINE SCIENCE FOR TEACHERS
Primarily for teachers grades 6 through 12, but open to others. Overview of living marine organisms (algae, invertebrates, fishes, marine mammals, and shore birds) in their natural environments. Also such topics as coastal zone problems, marine fisheries, economics of marine organisms, and the educational resources of the marine environment. Field work. Offered at the Isles of Shoals (Shoals Marine Laboratory) in cooperation with Cornell University. Three lectures and two labs or field trips per day. Prereq: college-level introductory biology. 1 cr. Cr/F. (Summers only.)

721. PARASITOLOGY
Introduction to the more important parasites causing disease in humans and animals. Living materials will be used as much as possible. Prereq: one year of zoology. Lab. 4 cr. (Not offered every year.)

723. CELL PHYSIOLOGY
Principles of chemistry and physics applied to understanding cell structure and function. Metabolic reactions and their control in relation to cell organization; genesis and function of specialized cells. Prereq: organic chemistry. Lab. 4 cr.

724. MARINE PARASITOLOGY
Diseases and parasites of marine fishes and shellfish; emphasis on the local estuarine environment. Prereq: one year of zoology. Lab. 4 cr. (Not offered every year.)

730. VERTEBRATE HISTOLOGY
Microscopic anatomy of vertebrate tissues and organs at the light microscope level; emphasis—mammalian histology; some comparative study of lower vertebrates. Prereq: Zool 508 or 518, or equivalent. Lab. 4 cr.

732. SOIL ZOOLOGY
Faunal communities of terrestrial soils, their ecology and natural history. Effects of animal activities on soil processes and composition. Collection, extraction, and study methods. Independent projects. Prereq: Biol 541. 4 cr. (Not offered every year.)

740. BIOLOGY OF ANIMAL REGENERATION
Principles of regeneration in various animal phyla. Discussion of experimental studies supplemented by laboratory work with living animals. Prereq: Zool 412. Lab. 4 cr. (Not offered every year.)

772. FISHERIES BIOLOGY
Information and techniques used by fisheries biologists. Emphasis on fish life history, ecology, and economics as related to management techniques. Prereq: Zool 711 or equivalent; permission. Lab. 4 cr.

775. INVERTEBRATE EMBRYOLOGY
Comparative study of reproduction and early development in selected invertebrates, providing a classical approach to morphology of gonads, fertilization, cleavage, gastrulation, and formation of larvae. Prereq: Zool 674 (UNH), Biol Sci. 364 (Cornell), or invertebrate zoology. Offered at the Isles of Shoals in cooperation with Cornell University. 3 cr. Cr/F. (Summers only, not offered every year.)

777. INTRODUCTION TO NEUROBIOLOGY
The nervous system, with emphasis on vertebrate and invertebrate preparations which most clearly demonstrate the basic concepts of neurobiology. Topics include: structure and function of neurons, development, cellular basis of behavior (sensory and motor systems), neuropharmacology, and neural plasticity (learning). Prereq: Zool 412 or permission. 4 cr.

778. COMPARATIVE NEUROPHYSIOLOGY
Designed for students of the behavioral and physiological sciences who wish to understand the basic electrophysiological properties of neurons and how they interact. Both invertebrate and vertebrate systems will be used to illustrate principles of synaptic transmission, integration, sensory information processing, and the control of movement. Prereq: Zool 777 or permission. Lab. 4 cr.

795, 796. SPECIAL PROBLEMS IN ZOOLOGY
B) Ecology; C) Endocrinology; D) Evolution; E) Developmental Biology; F) Genetics; G) Histology; H) History of Zoology; I) Invertebrate Zoology; J) Physiology; K) Vertebrate Zoology; L) Zoogeography; M) Zoological Techniques; N) Parasitology; O) Histochemistry; P) Protozoology; Q) Systematics; R) Animal Behavior; S) Teaching Practices. Students may elect one or more sections for advanced study. Reading, laboratory work, organized seminars, and/or conferences. Prereq: permission. (Limit of 12 credits from the sections of this course.) 1-4 cr.

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Associate Professor Emerita, Library; A.B., Wheaton College, 1929; S.B. in L.S., Simmons College, 1930; A.M. Middlebury College, 1939; (1943 to 1972).

Adams, Arthur S,
Former President and Consultant; Dipl., U.S. Naval Academy, 1918; M.A., University of California, 1926; Sc.D., Colorado School of Mines, 1927; (1948 to 1951, 1975 to 1976).

Allen, Fred E.
Professor Emeritus of Animal Sciences; B.S., University of New Hampshire, 1932; D.V.M., Ohio State University, 1936; (1940 to 1976).

Babcock, Donald C.
Professor Emeritus of Philosophy; B.A., University of Minnesota, 1907; M.A., ibid., 1908; S.T.B., Boston University, 1912; D.H.L. (Hon.), University of New Hampshire, 1960; (1918 to 1956).

Barraclough, Kenneth E.
Professor Emeritus of Forestry, Extension Forester Emeritus; B.A., New York State College of Forestry, Syracuse University, 1921; M.F., Harvard University, 1940; (1926 to 1963).

Bartley, Irving D.
Associate Professor Emeritus of Music and University Carillonneur; B.M., Syracuse University, 1935; M.M., ibid., 1938; (1945 to 1968).

Barton, Philip S.
Director Emeritus, Thompson School of Applied Science and Thompson School Professor Emeritus of Applied Animal Science, B.S., University of New Hampshire, 1928, M.Ed., ibid., 1938; (1939 to 1969).

Beckwith, Marion C.
Professor Emeritus of Physical Education; A.B., Oberlin College, 1935; M.Ed., University of New Hampshire, 1937. (1935 to 1979)

Bingham, Sylvester H.
Professor Emeritus of English; A.B., Dartmouth College, 1922; A.M., Harvard University, 1929; Ph.D., Yale University, 1937; (1936 to 1970).

Blickle, Robert L.
Professor Emeritus of Entomology; B.S., Ohio State University, 1937; M.S., University of New Hampshire, 1939; Ph.D., Ohio State University, 1942. (1935 to 1941, 1946 to 1979)

Bowring, James R.
Professor Emeritus of Resource Economics; B.S.A., University of Manitoba, 1936; M.A., University of Alberta, 1940; Ph.D., Iowa State University, 1944; (1948 to 1976).

Boynton, C. Hilton
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Brackett, Thelma
University Librarian Emerita; A.B., University of California, 1919; Certificate, California State Library School, 1920; D.H.L. (Hon.), University of New Hampshire, 1962; (1942 to 1961).

Bratton, Karl H.
Professor Emeritus of Music; B.M., University of Kansas, 1931; M.A., Teachers College, Columbia University, 1945; (1945 to 1971).

Carroll, Herbert A.
Professor Emeritus of Psychology; A.B., Bates College, 1923; A.M., Brown University, 1928; Ph.D., Columbia University, 1930; (1941 to 1962).

Chapman, Donald H.
Professor Emeritus of Geology; B.A., University of Michigan, 1927; M.A., ibid., 1928; Ph.D., ibid., 1931; (1931 to 1974).

Conklin, James G.
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Daggett, Albert F.
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Davis, Henry A.
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Professor Emeritus of Civil Engineering; B.C.E., Ohio State University, 1930; M.S.C.E., ibid., 1940; (1930 to 1976).

DeQuoy, Ruth W.
Associate State 4-H Leader Emerita; B.A., New Hampshire College, 1921; M.Ed., University of Maryland, 1953; (1929 to 1965).

Degler, Carroll M.
Professor Emeritus of Business Administration and Economics; A.B., University of Kansas, 1925; M.B.A., New York University, 1927; S.S., Columbia University, 1933; (1928 to 1973).

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Dunn, Stuart
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Professor Emeritus of Horticulture; B.S., Michigan State College, 1929; M.S., ibid., 1939; (1942 to 1946, 1948 to 1970).

Ellis, Elizabeth E.
Extension Associate Professor Emerita of Home Economics; B.S., Teachers College, Columbia University, 1927; M.A., ibid., 1929 (1929 to 1960).

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Assistant Professor Emeritus of Graphics, Cert. in M.E., Lowell Institute, 1938; (1954 to 1978).

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Granger, Ralph H.
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Hoitt, Samuel W.
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Professor of the Arts; A.B., University of South Carolina, 1955; M.F.A., Columbia University, 1957.

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Assistant Professor, Documents Librarian; B.S., Fitchburg State Teachers College, 1960; M.S., Simmons College, 1968.

Adams, Robert L.A. (1967)
Assistant Professor of Geography; B.A., Williams College, 1961; M.A., Clark University, 1966; Ph.D., ibid., 1971.

Aikins, Janet (1979)
Instructor in English; B.A., Grinnell College, 1972; M.A., University of Chicago, 1973.

Allmendinger, E. Eugene (1958)
Associate Professor of Naval Architecture and Associate Director of Marine Program; B.S., University of Michigan, 1941; M.S., University of New Hampshire, 1950.

Alonzo, Roy S. (1969)
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Associate Professor of Political Science; A.B., Bryn Mawr College, 1958; M.A., University of Minnesota, 1966; Ph.D., ibid., 1970.

Whitlock, John B. (1958)
Associate Professor of Music; B.Ed., Southern Illinois Normal University, 1937; M.A., State University of Iowa, 1941; Ph.D., ibid., 1958.

Whittier, Duane H. (1967)
Professor of Philosophy; B.A., University of New Hampshire, 1950; M.A., University of Illinois, 1952; Ph.D., ibid., 1961.

Wicka, John D. (1956)
Professor of Music; A.B., Harvard University, 1944; A.M., ibid., 1947; Ph.D., ibid., 1959.

Wilcox, Donald J. (1970)
Professor of History; A.B., Wesleyan University, 1961; A.M., Harvard University, 1962; Ph.D., ibid., 1967.

Williams, Carol L. (1978)
Assistant Professor of Nursing; A.S., Vermont College, 1970; B.S.N., The Catholic University of America, 1972; M.S.N., ibid., 1975; D.N.Sc., ibid., 1979.

Williams, Daniel C. (1970)
Associate Professor of Psychology; B.A., Northwestern University, 1966; Ph.D., University of California at Santa Barbara, 1970.

Williams, Thomas A., Jr. (1958)
Professor of English; B.A., University of New Hampshire, 1950; M.A., ibid., 1958.

Williamson, John E. (1976)
Faculty in Residence, Education; B.A., University of New Hampshire, 1961; M.Ed., ibid., 1969.

Willits, Robin D. (1965)
Professor of Administration and Organization; A.B., Middlebury College, 1947; B.S., Massachusetts Institute of Technology, 1948; Ph.D., ibid., 1965.

Wilson, John A. (1960)
Associate Professor of Mechanical Engineering; B.S., Tufts University, 1958; M.S., Northeastern University, 1960; Ph.D., ibid., 1970.

Wing, Barbara H. (1970)
Faculty in Residence, Spanish; B.A., Middlebury College, 1955; M.A.T., Harvard University, 1956; M.A., Middlebury College, 1971.

Wing, Henry J., Jr. (1970)
Associate Professor of Music; B.M., Oberlin Conservatory, 1952; M.M., ibid., 1953; Ph.D., Boston University, 1966.

Winn, Alden L. (1948)
Professor of Electrical Engineering; B.S., University of New Hampshire, 1937; S.M., Massachusetts Institute of Technology, 1948.

Winslow, Deborah (1978)
Instructor in Anthropology; B.A., Brandeis University, 1968; M.A., Stanford University, 1970.

Winslow, Mary Bowes (1978)
Assistant Professor of Education; B.A., University of California at Berkeley, 1945; M.Ed., University of Southern California, 1960; Ed.D., Harvard University, 1974.

Winslow, Ronald A., Jr. (1978)
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Witzling, Mara R. (1977)
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Wong, Edward Hou Sen (1978)
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Woodward, William R. (1975)
Assistant Professor of Psychology; B.A., Harvard University, 1967; M.A., Princeton University, 1969; Ph.M., Yale University, 1973; Ph.D., ibid., 1975.

Wright, Janice C. (1979)
Adjunct Lecturer in Medical Technology; Diploma, Mary Hitchcock Memorial Hospital, 1965; B.S., University of New Hampshire, 1965; M.T.(ASCP), 1965.

Wright, John J. (1970)
Associate Professor of Physics; B.S., Worcester Polytechnic Institute, 1965; Ph.D., University of New Hampshire, 1969.

Wright, Paul A. (1958)
Professor of Zoology; S.B., Bates College, 1941; A.M., Harvard University, 1942; Ph.D., ibid., 1944.

Wrightsman, Dwayne E. (1964)
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Yamamoto, Yutaka (1973)
Associate Professor of Philosophy; B.S., University of California at Berkeley, 1957; M.A., University of Michigan, 1967; Ph.D., ibid., 1973.

Yang, Jane C. (1966)
Assistant Professor, Catalog Librarian; B.A., Taiwan Normal University, 1961; M.S., Southern Illinois University, 1961; M.S.L.S., Pratt Institute, 1963.

Yildiz, Asim (1967)
Professor of Mechanics; Dipl., Technical University of Istanbul, 1953; D. Eng., Yale University, 1959.

Yildiz, Musa (1972)
Senior Research Fellow; B.S., St. Louis University, 1951; M.S., ibid., 1952; Ph.D., Stevens Institute of Technology, 1967.

Yount, John A. (1962-64, 1965)
Professor of English; B.A., Vanderbilt University, 1960; M.F.A., State University of Iowa, 1962.

Zabarsky, Melvin J. (1969)
Professor of the Arts; B.F.A., Boston University, 1958; M.F.A., University of Cincinnati, 1960.

Zaso, Gus C. (1970)
Associate Professor of Recreation and Parks; A.B., Syracuse University, 1957; M.A., Central Michigan University, 1962; Re.D., Indiana University, 1965.

Zezula, Jerilee A. (1979)
Thompson School Assistant Professor of Applied Animal Science; B.S., Michigan State University, 1970; D.V.M., ibid., 1971.

Zsigray, Robert M. (1970)
Associate Professor of Microbiology; A.B., Miami University, 1961; M.S., Georgetown University, 1967; Ph.D., ibid., 1969.

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*Indicates time devoted to Cooperative Extension Service
†Indicates time devoted to Agricultural Experiment Station

Cooperative Extension Staff

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Assistant Extension Educator and County Extension Agent, Home Economics, Cheshire County.

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Auger, Philip A., B.S.F. (1977)
Extension Instructor, Assistant County Extension Forester, and County Coordinator, Rockingham County.

Barker, Floyd V., B.S. (1967)
Associate Extension Educator, Extension Specialist, Environment and Co-Rural Safety Coordinator.

Berry, Nancy G., B.S. (1976)
Extension Instructor and County Extension Agent, 4-H, Sullivan County.

Black, Donald C., B.S. (1971)
Assistant Extension Educator and County Extension Forester, Strafford County.

Breck, Robert W., B.S., M.F. (1947)
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Breasett, Lauren L., B.S. (1976)
Extension Instructor and County Extension Agent, 4-H, Cheshire County.

Brushett, Lynda A., B.A., M.A. (1975)
Assistant Extension Educator and Community Development Agent, Pittsfield Area.

Buck, Charles W., B.S., M.S. (1955)
Extension Educator and Coordinator, County Extension Agent, 4-H, Hillsborough.

Bush, Judith J., B.S., M.A. (1979)
Assistant Extension Educator and County Extension Agent, Home Economics, Merrimack County.

Buteau, Shirley O., B.S. (1979)
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Butterfield, Elna S., B.S., M.S. (1978)
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Butterfield, Marcius R., B.S., M.S. (1962)
Associate Extension Educator, Associate Extension Program Leader, 4-H, and NHEMIS Coordinator.

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Extension Educator and Extension Program Leader, Agriculture.

Danko, Thomas, B.S., M.S. (1957)
Associate Extension Educator and Area Extension Agent, Poultry Management.

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Extension Educator and Extension Program Leader, Forestry.

Dole, Sumner A., III, B.S. (1977)
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Mackail, J. Curtis, B.S. (1979)
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Associate Extension Educator and County Extension Agent, Home Economics, Hillsborough County.

Parker, Louise A., B.A., M.S. (1979)
Assistant Extension Educator and Extension Specialist, Family Resource Management.

Patmos, Ray M., Jr., B.S. (1972)
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Roberts, Jeannette M., B.S., M.Ed. (1974)
Assistant Extension Educator and Extension Specialist, 4-H Youth Development.

Rogers, Glenn F., B.S., M.S. (1975)
Assistant Extension Educator and County Extension Agent, Agriculture, Grafton County.

Sargent, Leslie B., Jr., B.S. (1954)
Associate Extension Educator, County Extension and County Coordinator, Grafton County.

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Assistant Extension Educator, County Extension Agent, Agriculture, County Coordinator, Strafford County.

Seavey, David C., A.A.S., B.S., M.S. (1970)
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Extension Educator and Assistant Director.

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Administrative Divisions

Academic Affairs
Gordon A. Haaland, Vice President

Admissions
Eugene A. Savage, Dean

Affirmative Action
Nancy H. Deane, Director

Alumni Relations
William J. Rothwell, Director

Athletics and Recreation
Intercollegiate Athletics for Men
Andrew T. Mooradian, Director
Intercollegiate Athletics for Women
Gail A. Bigglestone, Director
Recreation
C. Michael O'Neil, Director

Biometrics
Jerry A. Warren, Director

Bookstore
Robert B. Stevenson, Manager

Budget and Administration
Allan B. Prince, Vice President

Business Administrator
Thomas L. Harvey, Jr.

Career Planning and Placement
Edward J. Doherty, Director

Center for Educational Field Services
Richard H. Goodman, Director

Center for Industrial and Institutional Development
John A. Haskell, Director

Chaplains
The Rev. Richard J. Coleman, Community Church (Prot.)
The Rev. Harold C. Criswell, Community Church (Prot.)
Fr. Joseph B. Desmond, St. Thomas More (R.C.)
The Rev. David L. Grainger, Campus Ministry
Fr. Frederick Pennett, St. Thomas More (R.C.)
The Rev. Albert W. Snow, St. Georges (Epis.)
The Rev. Roy Swanson, Evangelical Church

Computational Services
William J. Vasiliou, Executive Director

Continuing Education, Division of
Edward J. Durnall, Director

Cooperative Extension Service
Maynard C. Heckel, Director

Counseling and Testing Services
Thomas E. Dubois, Director

Dean of Students Office
William Kidder, Associate Dean

Development Office
Robert W. Leberman, Director

Engineering Design and Analysis Laboratory
Godfrey H. Savage, Director

Engineering & Physical Sciences, College of
Richard S. Davis, Dean

Financial Aid
Richard H. Craig, Director

Graduate School
Raymond L. Erickson, Dean

Health Services
Peter H. Patterson, Director

Health Studies, School of
Basil J.F. Mott, Dean

In-Service Training
Beverly A. Parker, Coordinator

Institutional Research
James A. Smith, Director

Jackson Estuarine Laboratory
Arthur C. Mathieson, Director

Liberal Arts, College of
Allan Spitz, Dean

Library
Donald E. Vincent, Librarian

Life Sciences and Agriculture, College of
Kurt C. Feltner, Dean

Marine Program
Robert W. Corell, Director

Media Services
John D. Bardwell, Director

New England Center for Continuing Education
Anthony S. Codding, Director

Ombudsman
Heidemarie C. Sherman

Personnel Office
Frederic E. Arnold, Director

President's Office
Jere A. Chase, Interim President

Physical Plant Operation and Maintenance
Nicholas R. Plebani, Director

Public Administration Service
Lawrence W. O'Connell, Director

Public Television (WENH-TV)
Keith J. Nighbert, Manager

Publications
Emily K. Smith, Director

Public Safety
David A. Flanders, Director

Radiation Safety Office
William Dotchin, Radiation Safety Officer

Registration and Records
Stephanie M. Thomas, Registrar

Research Administration
Raymond L. Erickson, Director

Reserve Officers Training Corps
Col. Donald L. Miller, Prof. of Aerospace Studies
Lt. Col. William C. Hazen, Prof. Military Science

Residential Life
Carol J. Bischoff, Director

Resources Development Center
William F. Henry, Chairperson

Space Science Center
Roger L. Arnoldy, Director

Student Activities/Memorial Union
J. Gregg Sanborn, Director

Student Affairs
Richard F. Stevens, Vice President/Dean of Students

Summer Session
Edward J. Durnall, Director

Thompson School of Applied Science
Lewis Roberts, Jr., Director

University Relations
Peter H. Hollister, Director

Water Resources Research Center
Gordon L. Byers, Director

Whittemore School of Business and Economics
Charles B. Warden, Jr., Dean

Enrollment Statistics — Fall Semester

	1976-1977	1977-1978	1978-1979	1979-1980	1976-1977	1977-1978	1978-1979	1979-1980	1976-1977	1977-1978	1978-1979	1979-1980
	Men				**Women**				**Total**			
Freshmen	1109	1142	1102	1151	1136	1135	1224	1303	2245	2277	2326	2454
Sophomores	1072	1129	1114	1117	1082	1148	1149	1201	2154	2277	2263	2318
Juniors	1052	1023	1078	1057	1038	1090	1096	1112	2090	2113	2174	2169
Seniors	1058	1067	997	1105	972	1063	1127	1135	2030	2130	2124	2240
1st Year—T.S.A.S.	217	190	167	193	125	108	117	107	342	298	284	300
2nd Year—T.S.A.S.	133	141	114	81	74	86	73	72	207	227	187	153
D.C.E.—A.A.	79	65	52	60	153	139	112	92	232	204	164	152
Graduates—Master's	501	442	379	370	321	331	327	352	822	773	706	722
Graduates—Doctorates	175	166	146	143	51	57	51	63	226	223	197	206
Total	**5396**	**5365**	**5149**	**5277**	**4952**	**5157**	**5276**	**5437**	**10348**	**10522**	**10425**	**10714**
Extension Credit Courses	716	741	658	673	841	912	869	999	1557	1653	1527	1672
Summer Session†	1460	1384	1554	1611	1799	1771	1988	2051	3259	3155	3542	3662
Baccalaureate Curricula	**Life Sciences and Agriculture**				**Liberal Arts**				**Engineering & Physical Sciences**			
Senior	437	466	433	402	794	741	777	751	262	303	335	443
Junior	450	427	396	371	768	795	774	803	302	316	391	399
Sophomore	363	381	316	339	922	927	991	1033	353	418	411	434
Freshman	356	328	355	304	933	960	1004	1176	451	471	483	466
Total	**1606**	**1602**	**1500**	**1416**	**3417**	**3423**	**3546**	**3763**	**1368**	**1508**	**1620**	**1742**
Baccalaureate Curricula	**Whittemore School**				**Health Studies**							
Senior	326	369	346	361	211	251	233	283				
Junior	363	352	381	374	207	223	232	222				
Sophomore	271	319	318	280	245	232	227	232				
Freshman	252	266	238	263	253	252	246	245				
Total	**1212**	**1306**	**1283**	**1278**	**916**	**958**	**938**	**982**				
Graduate Curricula*	**Graduate School**											
†Master's	822	773	706	722								
Doctorates	226	223	197	206								
Total	**1048**	**996**	**903**	**928**								
Associate Degree Curricula*	**Thompson School**				**Division of Continuing Education**							
2nd Year	207	227	187	153								
1st Year	342	298	284	300								
Total	**549**	**525**	**471**	**453**	**232**	**204**	**164**	**152**				

†Does not include Institutes and Special Summer Session in Technology.
*Graduate Curricula and Associate Degree Curricula should not be confused with any particular "college" column; they are separate entries.

Campus Map and Key

Admissions Office (see 89)
Agricultural Experiment Station (see 88)
1 Alexander Hall **J4**
2 Alumni Center, John S. Elliott **F2***†
Archaeol. Teaching & Res. Lab (see 19)
3 Art Annex **F6**
4 Babcock House **H6***
5 Barton Hall **C2**†
6 Batcheller House **H3**
7 Bookstore **F5**†
8 Brackett Field **E5**
9 Brook House **H2**
Cntr. for Industrial & Inst. Dev. (see 49)
10 Christensen Hall **H8***
11 College Woods **E7**
Computer Center (see 45)
12 Conant Hall **G5**
13 Congreve Hall **F3**
Cooperative Extension Service (see 88)
Counseling and Testing Center (see 78)
14 Dairy Bar **E3**
15 DeMeritt Hall **F4**†
16 Devine Hall **I5**†
17 Dimond Library **G5**[1]
18 DeMeritt House, Elizabeth **I2**
Eaton House (see 53)†
Elliott Alumni Center (see 2)*†
19 Archaeol. Teaching & Res. Lab **F8**
Engineering and Physical Sciences, College of (see 45)
Engineering Design & Anal. Lab (see 45)
20 Englehardt Hall **I5**
Faculty Center (see 28)
21 Fairchild Hall **I4**
22 Farm Service Buildings **B2**
23 Field House **D4**†
Financial Aid (see 89)
24 Fire Station and Service Building **F5**
25 Forest Park Apartments I **G7**
26 Forest Park Apartments II **F7**†
27 Gibbs Hall **I6**
Graduate School (see 83)
28 Grant House **H3**
29 Greenhouses and Pesticide Lab **C3**
Hall House (see 53)†
30 Hamilton Smith Hall **H4**
Health Studies, School of (see 34)
31 Heating Plant **E5**
32 Hersey House **H3**
33 Hetzel Hall **I4**
34 Hewitt Hall **F5**†
35 Hitchcock Hall **I6**
36 Hood House **H4**
Horton Social Science Center (see 83)*
37 Hubbard Hall **H7**
38 Huddleston Hall **I4**
39 Hunter Hall **I5**
39a Iddles Auditorium **H6**†
Instrumentation Center (see 45)
40 Pettee House **H2**
41 James Hall **F4***
42 Janetos House **I3**
43 Jessie Doe Hall **G2**
44 Kendall Hall **E4**
45 Kingbury Hall and Marine Programs Building **G6**
46 Lewis Field **D5**
Liberal Arts, College of (see 55)
Life Sciences and Agriculture, College of (see 88)
47 Livestock Activities Center **B3**
48 Lord Hall **F2**
Marine Programs (see 45)
Marston House (see 53)†
49 McConnell Hall **H6***
50 McLaughlin Hall **F3**
Mechanics Research Lab (see 45)
51 Memorial Field **E3**
52 Memorial Union Building **H5**
53 Mini Dorms (Eaton, Hall, Marston, Richardson, Sackett, Woodruff) **G8**†
53a Moiles House (4-H) **A4**
54 Morrill Hall **F4***†
55 Murkland Hall **G4**
Natural and Environmental Resources, Institute of (see 41)
56 Nesmith Hall **E4**
New England Center (see 57, 58, 59)
57 Adams Residential Tower **G2***
58 Administration Building **G2**
59 Kellogg Learning Center **G1***†
60 New Hampshire Hall **F3**
61 Nursery School **G3**
62 O'Connell House **H3**
63 Palmer House **I2**
64 Parsons Hall **G6**†
65 Paul Creative Arts Center **G5**†
66 Pettee Hall **E4**
Pettee House (see 40)
67 Philbrook Dining Hall **H7**
68 Poultry Plant **E6**
69 President's House **H3**
Public Administration Service (see 83)
70 Putnam Hall **C3**
70a Racing Commission Stables **C3**†
71 Randall Hall **H5**
Registrar (see 89)
Residence Office, housing (see 40)
Resources Development Center (see 95)
72 Rice House **I3**
73 Richards House **H3**
Richardson International House (see 53)†
74 Ritzman Nutrition Laboratory **E6**
75 Robinson House **I2**
76 ROTC Building, Zais Hall **F6**
Sackett House (see 53)†
77 Sawyer Hall **G3**
78 Schofield House **H2**
79 SCORE Building **F6**
80 Scott Hall **G3**
81 Smith Hall **G3**
82 Snively Arena **F2**
83 Social Science Center, Horton **H5***
84 Spaulding Life Science Center **G5**†
85 Stillings Dining Hall **G2**
86 Stoke Hall **H2***
87 Swimming Pool, outdoor **F2**
88 Taylor Hall **F4**
Theaters (see 65)
89 Thompson Hall **G4***†
Thompson School of Applied Science (see 5)
Tickets, athletic (see 23)
Tickets, cultural events (see 52)
90 Tirrell Classroom Building **B3**
91 Tirrell Light Horse Stable **B3**†
92 Tumor Research Building **E6**
93 Verrette House **H3**
Water Resources Res. Cntr. (see 66)
93a Water Treatment Plant **E8**
WENH-TV (see 52)
Whittemore School of Business and Economics (see 49)
94 Williamson Hall **G8***
95 Wolff House **I3**
Woodruff House (see 53)†
96 Women's Center **F6**
Zais Hall (see 76)

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*Building equipped with elevator
†Building accessible at ground level

Gray areas are parking lots (some are restricted).

Index

Abbreviations 17
Academic requirements 13-16
Accounting 76, 105-106. *See also* Administration
Accreditation 6
Administration program 69, 85-87. *See also* Five-year degree programs
Administrative divisions 186
Admissions 6-8
Advanced Placement 7
Aerospace studies 87. *See also* ROTC
Ancient and modern languages and literatures 88-94
Animal sciences 37, 94-95
Anthropology 24, 158-159
Architectural studies minor 25. *See also* course listing in The Arts
Art education 24
Art history option 25
Arts, The 24, 95-98
Art studio option 24
Associate degrees 7
Associate in Applied Science 19, 79
Associate in Arts 15, 19
Associate in Arts in General Studies 76
Athletic training option 64

Bachelor of Arts 15, 18-19, 24, 49, 51, 54, 57
Bachelor of Arts–Master of Business Administration program 22, 26, 30, 68
Bachelor of Engineering Technology *See* Engineering technology
Bachelor of Fine Arts 33
Bachelor of Music 18, 33
Bachelor of Science 18-19, 34, 35, 36, 48, 51, 52, 54, 57, 60
Bachelor of Science–Master of Business Administration 43, 45, 68
Banking 76, 106
BEOG 11
Biochemistry 37, 98
Biology 20, 34, 73, 98
Biomedical systems and instrumentation minor 46
Botany and plant pathology 37, 99-100
Business administration *See* Administration and Five-year programs

Calendar 2
California student exchange program 75
Campus 5
  map 188
  visits 6
Career mobility option 61
Career option minors 75
Career options 76-77
Career Planning and Placement Service 10
Chemical engineering 47, 100-101
Chemistry 48-50, 101-102
Chemistry teaching 49
Child-family studies 38
Civil engineering 50, 102-104
Classics 25, 88
Class standing 16
CLEP 7
College Council Placement Office 10
Communication 25, 161-162
Communication disorders 60, 105
Community development 39, 131
Computer engineering option 52
Computer science 55, 134. *See also* Mathematics and Computer Science
Consortium program 75
Constructed systems option, Civil engineering 50
Consumer studies 38
Continuing Education, Division of 80, 105-108
Cooperative Extension staff 184-185
Counseling and Testing Center 10
Courses, descriptions 84-166
Craftsmanship (stringed instruments) 106
Criminal justice 76, 108
Cultural programs 9

Dairy science 37
Dance 162
Dean of Students 9
Deferred admission 7
Degree requirements 7, 13-16
  Associate in Arts 15
  Bachelor of Arts 15
  College of Liberal Arts 21-22
  College of Life Sciences and Agriculture 36
  College of Engineering and Physical Sciences 45-58
  Dual degrees 15
  School of Health Studies 60
  Whittemore School of Business and Economics 69
Degrees 18-19
Deposits 12
Diamond Island Ocean Engineering Station 73-74
Dietetics 38
Dining 9, 12
Doctor of Philosophy degree 19
Drama *See* Theater
Dual degrees 15. *See also* Five-year degrees

Early Decision 7
Earth sciences 51, 52, 108
Earth science teaching 51
EBORN program 62
Economics 69, 109-111
Education 54, 111-113. *See also* Teacher preparation
Electrical and computer engineering 52, 113-114
Electrical engineering systems option 53
Electrical engineering technology 53
Elementary Education 54. *See also* Teacher preparation
Employment, part-time 11
Energy option 48, 56
Engineering and Physical Sciences, College of 44-58
Engineering technology 44, 45, 53, 115
English 26, 115-119
English teaching 26
Enrollment statistics 187
Entomology 38, 119
Environmental conservation 39
Environmental engineering minor 46
Environmental engineering option 48, 50
Environmental Resources 127-128
EXCEL program 61
Exchange programs 75
Exercise specialist in health maintenance 64
Expenses 11-12

Faculty 170-184
Faculty emeriti 168-170
Fees 11-12
Financial aid 11
Five-year degree programs 21, 22, 26, 30, 43, 45, 68
Foreign studies minor 23
Foreign studies program 75
Forest management option 40
Forest resources 40, 128-129
Forest science option 40
Forestry 35
French 26, 88

General Education Requirements 13
General Studies 38
Genetics 73
Geography 27, 120-121
Geology 51. *See also* Earth sciences
German 27, 89
Grades 14, 15
Graduate School 82
Graduation requirements 15, 16
Grants 11
Greek 27, 90

Handicapped Student Services 10
Health administration and planning 60, 121-122
Health Services 10
Health Studies, School of 59-66, 157
History 27, 122-124
History and philosophy of science minor 22
History, University 5
Home Economics 38, 124-126
Home economics education 38
Honors 14
Honors program 36
  See also individual departments in liberal arts
Hotel administration 70, 126
Housing 12
Humanities 20, 27, 126-127
Hydrology 41, 130

Independent study 47, 68, 131-132
Institute of Natural and Environmental Resources 39-42, 127-131
Insurance 76, 108
Intercollege courses 73, 131-132
Interdisciplinary minors 22, 45, 46
Interdisciplinary programs 19, 72-74
International and foreign area studies minor 23
Internships 68, 157
Italian 90

Jackson Estuarine laboratory 73
Japanese 91
Journalism 28, 115-119
Junior Year Abroad 75

Latin 28
Liberal Arts, College of 20-34
Library 5
Library science 76,106
Life Sciences and Agriculture, College of 35-43
Linguistics 28, 132
Loans 11

Majors, 16, 18-19. *See also* Second majors
Management 77, 108. *See also* Administration program
Map 188
Marine science 73, 74. *See also* Ocean engineering
M.B.A. program—see B.A.-M.B.A. program
Master of Business Administration program. *See* Bachelor of Arts-Master of Business Administration, and Bachelor of Science-Master of Business Administration
Master's degrees 19
Materials science minor 46
Mathematics and computer science 53, 132-134
Mathematics—chemistry option 55

Mathematics—computer science option 55
Mathematics—economics option 55
Mathematics education 54
Mathematics—electrical science option 55
Mathematics—fluid dynamics option 56
Mathematics—mechanics option 56
Mathematics—physics option 56
Mathematics—thermodynamics option 56
Mechanical engineering 56, 134-138
Mechanical engineering technology 53
Mechanics Research laboratory 73
Medical technology 61, 137
Memorial Union 9
Merchandising 77, 107
Merrimack Valley College exchange 75
Microbiology 28, 137-138
Military science 138. *See also* ROTC
Minors 16, 19, 47
Music 29, 33, 138-141
Music history option 29, 138
Music performance option 29, 139-140
Music theory option 29, 140-141
Music preteaching option 29, 141

Natural and environmental resources 127
New England Regional Student Program 8
New Hampshire College and University Council 75
Noncredit courses 80
Nursing 62, 141-142
Nutrition 38

Occupational education 43, 142-143
Occupational therapy 62, 143-144
Ocean engineering minor 45
Oceanography 46, 74
Options 18-19
Off-campus study 75

Park management 66
Pass/Fail 14
Philosophy 29, 144-146
Physical education 64, 147-149
Physics 57, 149-150
Physics teaching 49
Placement Service. *See* Career Planning and Placement Service
Plant science 43, 150-151
Political science 30, 151-154
Poultry science 37
Predental program 72
Prelaw 71
Premedical program 72
Preparing for teaching. *See* Teacher preparation
Pre-physical therapy option 65
Preveterinary medicine 37
Principal officers of administration 167
Psychology 30, 154-156

Quality control 77, 107
Quantitative science option 40

Readmission 7
Real estate 77, 107
Recreation administration 65
Recreation and parks 65, 156
Religious studies 156
Religious studies minor 23
Research opportunities 47
Residence halls 9, 12
Residence requirement 16
Resource economics 41, 130-131
Room and board 12
ROTC 74, 87, 138
Russian 31, 91-92

Sanskrit *See* course: Classics 595
Scholarships 11
SCUBA diving 74, 148
Second majors 16
Secretarial studies 70, 157
Shoals Marine Laboratory 73-74
Social sciences 20, 157
Social service 31, 157-158
Social work. *See* Social service
Sociology 31, 159-160
Soil science 42, 131
Spanish 31, 92-94
Special student status 8
Special University programs 71-75
Speech and drama. *See* Theater and communication
Sports communication option 65
Student activities 9
Student Affairs, Division of 9-11
Student-deaigned majors 72
Student-designed option 53
Student exchange programs 75
Student Liability insurance 60
Student teaching 21-22
Summer session 81

Teacher preparation 20-22, 24, 26, 29, 47, 49, 51, 54, 64. *See also* Education
Teaching-Learning Council 73
Technology 161
Theater 32, 163-164
Theater and communication 161-164
Thompson School of Applied Science 79, 164
Traffic and distribution management 77, 107
Transfer students 8
Trustees 167
Tuition 8, 11

Undeclared major 36
Union, Memorial 9

Whittemore School of Business and Economics 67-70
Wildlife management 42
Withdrawal 16
Wood science option 40
Women's studies 164
Women's studies minor 23
Work-Study Program 11

Zoology 32, 164-166

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